FLIGHT

The AIRCRAFT ENGINEER & AIRSHIPS

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Founder and Editor : STANLEY SPOONER

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DIARY OF FORTHCOMING EVENTS

Club Secretaries and others desirous of announcing the dates of important fixtures are invited to send particulars for inclusion in this list:—

1927

Feb. 28 .... **Aero Golfing Soc. Match, Rickmansworth.**
Mar. 2 .... **Banquet to Sir Samuel Hoare and Lady Maud Hoare at Savoy Hotel, London**
Mar. 2–3 .... **R.A.F. Boxing, Halton Camp.**
Mar. 3 .... **"The Spinning of Aeroplanes." Mr. L. W. Bryant, before R.Ae.S.**
Mar. 4 .... **Second House Dinner of Inst.Ae.E., at Engineers' Club.**
Mar. 8 .... **"Portable Hangars." Major H. N. Wyllie, before Inst. Ae.E.**
Mar. 12 .... **R.A.F. India Command 4th Reunion Dinner, New Princes Restaurant.**
Mar. 16 .... **Inst. Ae.E. Visit to the Factory of A.D.C. Aircraft, Ltd., Waddon.**

EDITORIAL COMMENT.

MR. WELLS is peeved. Mr. Wells, according to his own repeated statement, has flown fairly often. Mr. Wells flies no longer. Mr. Wells finds it too uncomfortable, irregular, and stupidly dangerous. Mr. Wells supposes that he has spent almost as many hours waiting at various terminal aerodromes as he has spent in the air. Altogether, Mr. Wells, who poses as a very great authority on almost everything under the sun, is thoroughly "fed up" with the lack of progress in civil aviation. In his slashing article in *The Sunday Express* of February 20, he says so in five columns. He has, we seem to remember, said something of the sort before, and he states that whenever he publishes facts concerning the unreliability of air travel, the "air Press" (whatever that may mean) becomes extremely heated and defensively rude about it. As humble representatives of the alleged "air Press" we will try not to become "defensively rude" about it. We would merely, in all humility, point out that the statistics relating to air transport do not bear out Mr. Wells's personal experience, which must, we cannot help thinking, have been singularly and quite exceptionally unfortunate.

H. G. Wells on the Warpath

Mr. Wells professes to make what he describes as probably a vain effort to propitiate the air Press by conceding that the people who are running air transport to-day could not do better than they are doing. That is precisely where Mr. Wells is wrong. They could do better, without a doubt, and we believe they *are* doing better (a la Coué) and even better and better, and that if Mr. Wells were to repeat his experiment during the coming summer, he would, perhaps, be a little less sour in his judgment.

Mr. Wells says that the crux of the whole business lies in the comparative under-development of the financial and business and political worlds in respect to the vast expansion of mechanical and economic possibility. Although it may surprise Mr. Wells, there again we cannot agree. He states that he does

not regard the present rarity, danger, and unattractiveness of flying as being due to any defects in the aeroplane or airship itself, that physical science and mechanical invention have failed at no point. We are afraid that this shows that Mr. Wells does not quite appreciate the position. Although fully agreeing with him as to the need for financing air transport on a large scale, we cannot share his view that the slowness of development has been entirely due to insufficient capital. The science and art of flying, and more particularly that side of it dealing with air transport, is still very young. Mr. Wells seems to overlook the fact that it is only some eight years since the first uncertain and groping attempts were made to operate air services over defined routes, and that those attempts were made, necessarily had to be made, with war types of aircraft. There is thus no cause for surprise if we have not yet advanced quite as far as Mr. Wells could have wished. On the subject of financial assistance on a large scale, it was scarcely to be expected that this would be forthcoming until those holding the purse strings could be reasonably sure that aircraft had reached a stage of technical development where such financial support was justified. And until comparatively recently aircraft had not reached such a stage, in spite of the rather touching belief of Mr. Wells in the technical perfection of aircraft.

Mr. Wells, it seems to us, goes right off the rails when he complains that the whole thing is not being tackled on grand international lines, and is very unfortunate in at least one of his comparisons. "It is," he says, "as sensible to hope for an air transport system developed on national lines as it would be to hope for an inter-oceanic railway system through the coalescence of mile and half-mile bits of line built, each at its own sweet will, to its own design and gauge, by every village and township en route." From a man who has written a work which, we believe, has been described as an outline of history, this is surely a rather extraordinary statement to make. Does Mr. Wells claim that as soon as the first locomotive had been produced, and the first crude carriages, all the nations of Europe got together and said that now this new thing must be tackled on international lines? We do not think Mr. Wells will claim any such thing. The railways started very much indeed in the bit-by-bit manner to which Mr. Wells refers so contemptuously, and it was not until much later, until technical development was much more advanced, in fact, that the various lines began to be linked up—even *now* there are still in places blind-alley lines which await their linking up. That must also be the method in world-wide air travel. Until, at any rate, the majority of all the technical problems have been solved, it would be futile to tackle international air transport on the grand scale which Mr. Wells would have us forthwith adopt, and they definitely have not been solved yet, although in this respect the outlook is not as gloomy as that of Mr. Wells on the difficulties of the international arrangements.

It is unfortunate that Mr. Wells should have thought fit, in his article, to mix up air service accidents with the problem of air transport. The two things have nothing to do with one another, or, at any rate, the connection between the two is a very vague one, arising merely from the fact that service machines and civil aeroplanes fly according to the same physical laws. In the operation of the two types there is no similarity at all, and there would be just as much sense in adding casualties in the submarine service, for instance, to those in the mercantile marine. One is justified in expecting greater discrimination in a man of Mr. Wells's calibre.

We trust Mr. Wells will not consider that we have been "defensively rude" in stating our views of the subject, but when a writer, who is apt to be accepted by the general public as an authority on any subject upon which he chooses to write becomes "offensively rude" (we mean it, of course, in the same military sense as that in which Mr. Wells used the expression "defensively rude," and not as a rudeness at which one takes offence), on air transport matters, the "air Press" can scarcely be expected to take it "lying down" simply because it expresses the ex cathedra views of so great a man even as Mr. H. G. Wells.

At Buckingham Palace

H.M. THE KING held an Investiture at Buckingham Palace on February 15, when amongst those invested by the King with the Insignia of the respective divisions of the orders into which they have been admitted, were the following:—

Order of the British Empire.

Military Division.

Officer.—Flight-Lieut. Albert Fletcher, R.A.F. Member.—Flight-Lieut. Robert. Greenlaw, R.A.F.

His Majesty then conferred the following decorations:—

Royal Red Cross.

Member.—Miss Mary Campbell, late Princess Mary's R.A.F. Nursing Service.

Military Cross.

Flight-Lieut. Sturley Simpson, R.A.F.

Distinguished Flying Cross.

Squadron-Leader Robert Saundby, R.A.F., Flight-Lieut. Sydney Pope, R.A.F., and Flight-Lieut. Elmer Roberts, R.A.F.

Air Force Cross.

Flight-Lieut. Matthew Dick, R.A.F.

Amongst those also present were Air-Marshal Sir John Salmond (Principal Air Aide-de-Camp), and Group-Capt. P. F. M. Fellowes, R.A.F.

R.A.F. Air Aide-de-Camp to the King

THE Air Ministry announces the appointment of Group Captain Robert Peel Ross, D.S.O., A.F.C., as an Aide-de-Camp to His Majesty the King (February 1, 1927).

Some Paris-Jask Figures

CERTAIN interesting figures concerning the Breguet machine with 500 h.p. Hispano engine on which Costes and Rignot established a new distance record last year are now available. The weight of the machine "equipped" but without crew and fuel was 1,518 kg. (3,340 lbs.); crew, food and luggage weighed 250 kg. (550 lbs.). When the machine started from Le Bourget it had on board 2,280 litres (502 galls.) of petrol, 820 litres (180 galls.) of petrol-benzol mixture, and 200 litres (44 galls.) of oil. The fuel weight was 2,209 kg. (4,860 lbs.) and the weight of oil 180 kg. (396 lbs.), giving a total loaded weight of 4,157 kg. (9,146 lbs.). As the wing area of this particular machine was 52·75 sq. m. (568 sq. ft.), the wing loading was 16·1 lb./sq. ft. On the basis of the nominal power of the engine the power loading was 18·3 lb./h.p., although probably the actual power loading was rather less, owing to the Hispano developing a maximum of more than 500 h.p.

Aerial Search for Col. Fawcett

IN a recent issue, we referred to the uneasiness caused by the silence of Col. Fawcett who is leading an expedition into the heart of Brazil and the probability of aeroplanes making a search for him. As an attempt on land has failed, this plan may now be carried out.

[" FLIGHT " *Photographs*

RACING INFLUENCE : These two views of the " Gloster Gorcock," with Napier Aero Engine, illustrate the effect which experience in the design of racing aeroplanes has on design of service types. In the upper photograph the machine is actually flying, about one foot off the ground. Concerning the lower picture, all we need say is that our photographer is still with us.

THE "GLOSTER GORCOCK"

Napier Engine

A SUBJECT which is often discussed is whether, and if so to what extent, air racing is likely to have any direct beneficial results on machines of service type. In America, judging by events, the view is obviously held that air racing is worth while, and the result has been a series of very fine single-seater fighters. In this country, for a long time, the British Air Ministry did not appear to think air racing worth any special encouragement. A couple of years ago, or so, there was a change of view, and a definite part of our policy is now a "high-speed flight" for experimental and development work on fast aircraft.

["FLIGHT" *Photograph*

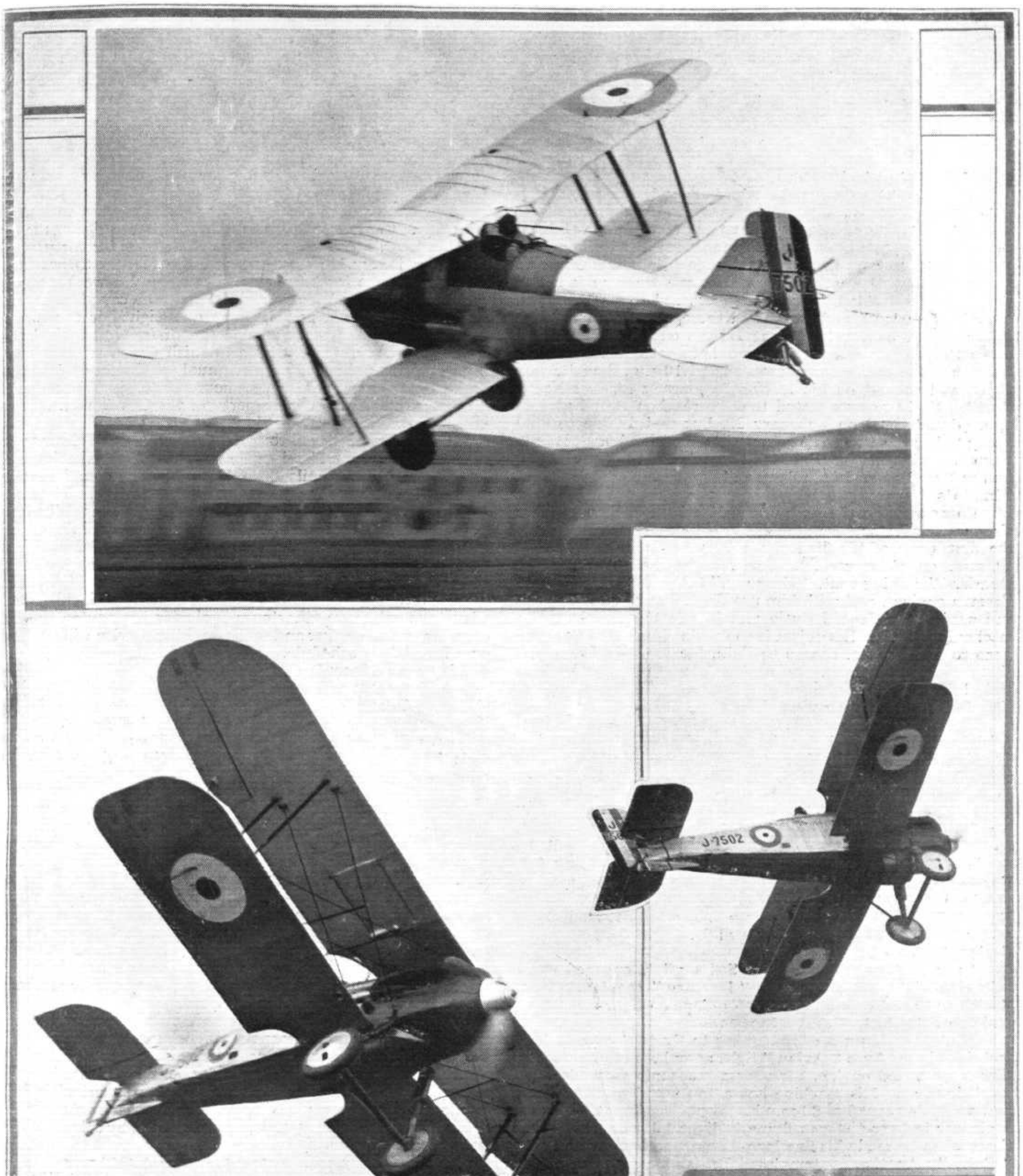
THE "GLOSTER GORCOCK": Three-quarter front view. Note the clean nose and careful streamlining generally. The engine is a Napier "Lion"

["FLIGHT" *Photograph*

THE "GLOSTER GORCOCK": Side View. The family likeness to "Gloster" racing aircraft is obvious

The Gloster Aircraft Company has had longer experience in the production of high-speed aircraft than has any other British firm, and thus one somewhat naturally watches that firm's service machines for traces of racing influence. In the photographs of the "Gorcock" published on this page, and on the preceding and following pages, this influence is not difficult to trace. Allowance must, of course, be made for service considerations, and the extent to which the pilot's head projects, the "humped" back of the fuselage to give him a better view past the top plane, are features which one would not expect in a racing machine. Apart from that, however, the "Gorcock" is an extremely "clean" machine.

Nowhere, perhaps, is this influence of racing experience more noticeable than in the fairing of the cylinder banks of the Napier engine, and the small extent to which the inner portion of the propeller is interfered with by the fuselage behind it. These points are easily recognised in the photographs, and so may be referred to. Other features of what is a very interesting machine cannot be mentioned.



["FLIGHT" Photographs

THE "GLOSTER GORCOCK," in action, piloted by Flying Officer H. J. T. Saint, D.S.C. This machine is one of the fastest single-seater fighters in the world.

AIRISMS FROM THE FOUR WINDS

Pinedo's Atlantic Flight

THE Marchese de Pinedo, who is carrying out a 25,000-mile World flight on a Savoia S.55 seaplane, was unable to start his Atlantic crossing from Bolama (Portuguese Guinea) as originally intended. He made several attempts, on February 16, to take off, but with its exceptionally heavy load and unfavourable weather conditions, the machine failed to rise. Pinedo decided, therefore, to proceed to Porto Praya, Cape Verde Island, and start from there, where he arrived on February 18, having landed at Dakar, en route. On February 19 he again experienced trouble in getting the heavily-laden machine to rise, but succeeded at 1.10 a.m. the following night, and set out on his 1,700-mile journey to Port Natal, Brazil. Early reports stated that he reached Brazil at 1.20 p.m. (Brazil time) on February 22, but was unable to land owing to heavy sea, and so returned to the island of Fernando Noronha, alighting off the island and being towed into port by the Brazilian cruiser " Barosso."

Pinedo's Uruguayan Rival

FOLLOWING on the path of the Marchese di Pinedo is the Uruguayan aviator, Commandant Larrabordes, who started on the first stage of his flight from Pisa to South America at 10 a.m. on February 20. Senor Larrabordes is flying a Dornier-Wal flying boat, " Uruguay," fitted with two 500-h.p. Farman engines, and with him are Capt. Ibarra (second pilot and navigator), Capt. Larrabordes (wireless operator), and a mechanic, Rigoli. His object is to fly via Dakar and Pernambuco to Montevideo, thence to Chili, Mexico, San Francisco, along Alaska to Japan, the Indies, Aden, Suez and back to Italy ! Larrabordes arrived at Alicanti on February 20.

Cairo-Karachi " Hercules " Nos. 4 and 5

THE fourth of the D.H. " Hercules " air liners (3 Bristol " Jupiters ") intended for the Cairo-Karachi air route, left Croydon at 7 a.m. on February 23 en route for Cairo. It was piloted by Capt. W. G. R. Hinchliffe, and in addition to a crew of four, carried seven passengers, including Capt. and Mrs. de Havilland and four women passengers. "Hercules" No. 5 will leave Croydon on March 10 for Cairo and Baghdad, and Imperial Airways announce that passengers will be carried on this trip, the fare from London to Cairo being £50. Further particulars regarding intermediate rates, etc., may be obtained from " Airways " House, Charles Street, Lower Regent Street, S.W.1. The through service between Cairo and Karachi will be opened on April 6.

Swiss African Flight

LIEUT. MITTELHOLZER, the Swiss pilot, engaged on a scientific flight (in a Dormer " Mercury " seaplane) from Zurich to Cape Town, arrived at the Cape on February 21.

British Flights to the Antipodes

MR. BERT HINKLER is planning to fly to Australia in a fortnight in an Avro " Avian " light aeroplane with a 60 h.p. Cirrus air-cooled engine, carrying a mechanic with him and small luggage. His machine has a top speed of 105 m.p.h. and a cruising speed of 90 m.p.h. Bert Hinkler, of course, is a pioneer in long-distance flying in light 'planes, from those times when he made his fine long-distance flights on the Avro " Baby." Another contemplated British long-distance flight to this part of the world is that of Capt. Courtney's from England to New Zealand in 10 days on a flying boat.

The Seville-Buenos Aires Air Line

IN a recent issue we referred to the new German airship, L.Z.127, under construction for the Spanish-South American service to be started about the end of this year. It is now probable that the ship will fly first to the North Pole for a test flight. It will have twenty double-berth cabins, a lounge and dining-room for forty passengers. Large windows will give a wide view of the earth and sea. A concession for establishing the service between Seville and Buenos Aires was signed by King Alfonso on February 12, in favour of the Colon Compañia Transaera, which is co-operating with Germany for technical guidance. An airport at Seville will hortly be commenced, and three semi-rigid ships will be constructed there, whilst, in addition to the main mooring masts at the termini, it is proposed to erect ten emergency masts down the African and South American coasts. It is rather indefinite as to whether the L.Z.127 is for this particular service or another on the same route, as a report states that a Vickers' airship may be used. Colonel Hcrerra, the chief promoter of the Colon Company, proposes to make a trial flight to Buenos Aires in a hired airship about the end of this year. The concession will extend for forty years, and even longer if necessary, and the plan is to provide a monthly service for the whole distance and a weekly service between Seville and the Canary Isles, with a carrying capacity of forty passengers and 10 tons of freight for the former, and sixteen passengers and one ton of freight for the latter. For each successful voyage the Spanish Government will pay the company £17,500, with an annual maximum of £210,000 ; and when the payments made amount to £1,050,000 the Seville airport shall become the property of the Government.

Khartoum-Kusumu Air Service

CAPT. T. A. GLADSTONE left Kisumu on February 14, as reported in our last issue, and arrived at Khartoum on February 19 with mails from Uganda, thus completing the first service flight of the new East African air line. The mails, 120 lbs., were then taken over by the R.A.F. for delivery to Cairo on February 20. This means a saving of 15 days. His total flying time was 23 hours, but this included a visit to Entebbe, Uganda, whilst it is estimated that normally the single journey will take three days of seven hours' flying on each. Weather conditions are considered ideal. Capt. Gladstone will leave Khartoum again for Kisumu on March 1 carrying one passenger and mails, and the service will continue on a fortnightly schedule.

A Liner as Aircraft Carrier

A SEAPLANE will be carried on the Norddeutscher-Lloyd steamer *Lutzow* during its four pleasure voyages in the Mediterranean in the coming spring and summer. Passengers will then be able to enjoy flights round the coasts. This is a novel idea, which apparently springs from the adaptation of the seaplane carrier.

A Fast Paris-Brussels Trip

FLYING on a Farman machine from Paris to Brussels on January 29, the French pilot, M. Corbu, covered the distance, 170·8 miles, in 1 hr. 3 mins., at an average speed of 162·8 m.p.h.

A Portuguese World Flight

PORTUGUESE aviators are to attempt to tour the world, crossing five continents in the progress. A Dornier-Wal with 450 h.p. Lorraine-Dietrich engines will be under the command of Maj. Sarmento de Beires, the crew including Cmdr. Cabrai, the father of the well-known pilot, Saccadura Cabrai, who was lost in the sea off Nord, Officer-mechanic Gouveya, and Navigator Contero.

Invisible Searchlight Beams

CAMOUFLAGING searchlight beams so that they appear to have gone out when actually they have not is claimed as one of the uses of what is called " black light." Its inventor is Mr. J. L. Baird, of Glasgow, and the main principle is to obtain vision when there is no visible light. Apparently aircraft flying on dark nights could be located by this apparatus without their knowing.

Instruction in Aeronautics for Naval Officers

IT was recently announced that the Admiralty has appointed Rear-Admiral W. M. Kerr, C.B.E., as President of a Committee which includes a member representing the Air Ministry, to consider the question of including in the general education of junior Naval executive and Royal Marine officers a course of instruction in aviation. It will investigate this proposal in order to find the best means of giving these officers some fundamental knowledge in naval aviation, that they may correspondingly appreciate its value and limitations. Rear-Admiral Kerr commanded the aircraft-carrier *Eagle* from April 24, 1925, to October, 1926, and attained flag rank on January 24. He is a navigation specialist, and was appointed a war staff officer in 1913.

British Entries for Schneider Cup Race

As we go to press we learn that the Royal Aero Club has sent to the Aero Club of Italy an entry of a team of three seaplanes to represent Great Britain in the forthcoming Schneider Cup Seaplane Race, which will take place at Venice in September.

LIGHT 'PLANE CLUB DOINGS

ondon Aeroplane Club

Flying Time.—Fog again interfered with flying during the earlier part of e week, and we were only able to make a start late on Thursday afternoon he total time for the week ending 19th inst. was 30 hrs. 5 mins.

Pilot Instructors.—Capt. F. G. M. Sparks, Capt. A. S. White, Capt. C. D. arnard, Flying Officer R. W. Reeve.

Dual Instruction.—F. Clarkson, G. H. Saxon Mills, G. Eady, S. Pritchard-arrett, Miss Spooner, G. Wallcousins, C. H. Swan, F. E. Rose Richards, A. J. ulder, R. C. Presland, H. O. Guggenheim, Miss O'Brien, D. S. Hewitt, R. P. Cooper, R. Drysdale Smith, L. W. Gibbens, C. R. Campkin, A. F. Wallace.

Solo Flying.—S. O. Bradshaw, O. J. Tapper, E. S. Brough, H. Spooner, G. Eady, A. F. Wallace, Sqdn.-Ldr. M. E. A. Wright, Miss O'Brien, N. H. Jones, R. Malcolm, D. H. P. Esler, C. R. Campkin, R. P. Cooper, A. G. D. Alderson, R. C. Presland, A. R. Ogston, K. V. Wright, P. G. Lucas, G. H. Craig, S. Pritchard-Barrett, G. Wallcousins.

Joy Rides.—C. P. Brady, Miss Tuff, S. H. Smith.

Norwich Meeting.—The club will be sending a D.H. "Moth" in charge of Capt. F. G. M. Sparks to the Norwich meeting on Friday, the 25th inst. The Hon. Lady Bailey is taking delivery of her D.H. "Moth" this week and will also fly to Norwich to represent the club.

"Bristol" Brownie.—The "Bristol" Brownie was flown solo 27 times during he week by members who had qualified for their aviator's certificate.

The Lancashire Aero Club

REPORT for week ending February 19:—Dual with Mr. Brown: Miss Brown, 1 hr. 45 mins.; Messrs. Nelson, 1 hr. 25 mins.; Caldecott, 50 mins.; MacNair, 50 mins.; Davidson, 35 mins.; Newton, 25 mins.; Heys, 25 mins.; Williamson, 20 mins.; Twemlow, 20 mins.; Parker, 10 mins.; Dickinson, 10 mins.; Goodyear, 10 mins.; Crosthwaite, 10 mins. With Mr. Scholes: Mr. Ruddy, 10 mins.

Solo:—Messrs. Slater, 1 hr. 10 mins.; Catterall, 1 hr. 5 mins.; Wade, 20 mins.; Twemlow, 20 mins.; Costa, 15 mins.; Scholes, 10 mins.

Joy-rides:—With Mr. Lacayo: Miss Willett, 15 mins.; Mr. Ramsden, 15 mins. With Mr. Goodfellow: Mrs. Leeming, 15 mins. With Mr. Costa: Miss Dodd, 15 mins. With Mr. Brown: Messrs. Jones and Thompson, 10 mins. each. With Mr. Cantrill: Mr. Spruce, 10 mins.

Test flights:—1 hr. 40 mins. Total flying time for the week, 14 hrs. 15 mins.

"Fierce howls the tempest through the shivering trees,
The scudding cloud-wrack greys the endless sky;
Grouped on the tarmac in their twos and threes
Earnest young pilots wait their chance to fly.

"Anon the tempest ceases and the rain
(Ah! gracious rain that givest all things birth)
Descends. The pilots wait and wish amain,
Watching the fast-disappearing earth.

"Tempest and rain depart. Steals through the air
That all-pervading wraith we know too well.
Fog holds. And who shall blame us if we swear
(Gently) 'Well, what the Hell, boys, what the Hell!'?"

Midland Aero Club, Ltd.

REPORT for week ending February 19:—The total flying time was 7 hrs. 26 mins.

The following members were given dual instruction by Mr. McDonough:—J. Brinton, H. Beamish, C. Fellowes, H. D. Coleman.

The following "A" pilots made solo flights:—W. Swaun, G. V. Perry, E. R. King, E. J. Brighton.

Passengers with Mr. Brighton:—S. H. Smith, W. Nunn, V. M. Parsons, C. H. James.

On Thursday Wing-Comdr. Rippon had a flight with Mr. McDonough.

Mr. C. Fellowes made his first solo on Saturday, which was satisfactorily carried out. He afterwards flew for 15 minutes solo.

Fog has been very prevalent throughout the week. On Sunday visibility was extremely bad at 1,000 ft., but at 2,000 ft. the air was exceptionally clear with brilliant sunshine.

The annual general meeting of the club was held at the Queen's Hotel, Birmingham, on February 17, when the following officers were elected for the ensuing year: chairman, Mr. J. G. Wood, hon. treasurer, Mr. H. A. Pepper; hon. secretary, Maj. G. Dennison.

A very hearty vote of thanks was passed to the retiring chairman, Maj. R. V. C. Brook, for the valuable assistance rendered to the club during his term of office.

The hon. treasurer presented the balance-sheet and said that, although they were not able to boast of anything in the nature of untold wealth, they were managing to hold their heads above water. Having regard to the many difficulties which the club had had to face and the fact that this was the first and necessarily experimental year of operations, he considered the results were satisfactory. The light aeroplane clubs were something quite new, and they consequently had no past experience to guide them. He believed that. 1927 would be a bumper year.

Maj. Brook considered that the recent reduction in flying charges from £2 to 30*s*. per hour for solo was a very good move and would mean more flying and an increase in revenue in the long run, as it provided the "A" pilots with an incentive to put in more flying, and what the Air Ministry wanted was a good record of hours flown. A general discussion on the various points raised then followed.

The Newcastle-upon-Tyne Aero Club

REPORT for week ending February 20.—Total flying time, 16 hrs. 50 mins. —LX 1·45, LY 14·30; P.O. (Avro), 35 mins.

Mr. Parkinson was at C.F.S., so all flying was by pilot members.

The following members flew with passengers:—Mr. J. D. Irving with Messrs. N. S. Todd, Pike, Gibson, and J. Bell. Mr. Forsyth Heppell with Mrs. Heppell, Dr. Dixon and Mr. Turnbull. Mr. C. Thompson with Mrs. Heslop, Mr. Thirlwell and Mr. Boardman. Dr. Dixon with Mr. Thirlwell, Mr. Phillips and Mr. A. Bell. Mr. W. B. Ellis with Mrs. Ellis, Mr. Turnbull. Mr. A. Bell with Mr. J. Bell.

On Wednesday, a short picnic flight was arranged, the route being Cramlington to Chillingham Castle, Bamburgh, Cramlington.

The following members took part:—Mr. Heppell (Avro), with Mrs. Heppell and Dr. Dixon, Lord Ossulton on his own "Moth," with Miss Dunford, Mr. N. S. Todd and Mr. J. D. Irving (LX), Mr. Phillips and Mr. A. Bell (LY).

It was a clear day, with a strong wind at Cramlington, but this dropped soon after leaving the aerodrome.

The party was received at Chillingham Castle by the Countess Tankerville, and after light refreshments all proceeded to go on to Bamburgh, where lunch had been ordered at the Lord Crewe Arms. Lord Ossulton and the pilots of the two club "Moths" got away in good style, but owing to the bumpy nature of the ground, the Avro sustained damage to its undercarriage while attempting to take off, and had to be left behind, Dr. Dixon flying with Mr. Phillips for the remainder of the journey. As the Avro could not be moved, it was dismantled and returned by motor lorry on Thursday to the aerodrome. Mr. and Mrs. Heppell and the Secretary supervised the dismantling (while the other members of the party enjoyed what apparently was an excellent lunch), returning to the aerodrome later in the day in a car kindly lent by Lord Ossulston. It was a very good day, in spite of the mishap, which added that touch of adventure which would have been lacking had all the machines finished.

It has been decided to hold this year's flying meeting on Saturday, September 3.

It is hoped that we will have the pleasure of meeting representatives of other clubs at Norwich on the 25th.

The Yorkshire Aeroplane Club

REPORT for week ending February 20.—Total flying time for the week, 9 hrs. 45 mins., made up as follows:—Solo, 5 hrs. 5 mins.; dual, 3 hrs. 35 mins.; tests, 1 hr. 5 mins.

Solo flights were made by Messrs. Dawson, Mann, Wood, Lax, Norway and Carter, and the following flew dual:—Messrs. Batcock, Lax, Oglesby, Wilson and Brown.

On Sunday, February 20, Messrs. Mann, Dawson and Wood successfully completed their flying tests to qualify for their "A" licences. Afterwards Mr. Mann flew Mr. Dawson back to his home at Nun Appleton Hall.

One understands that representatives of the club are taking a "Moth" to Norwich on Friday, when there will be a general gathering of the clubs with the idea of enlivening interest in the formation of a new club at Norwich. One wishes the scheme every success, and hopes that other large towns will follow their example.

Note.—Before closing this report one should mention that two of our members, Mr. D. D. Little, Vice-Chairman of the club, and Miss McPherson, committed matrimony on Tuesday last. Is this an inter-club record?

THE HAMPSHIRE AEROPLANE CLUB: Two of the "Moths" and some members of the energetic South-Coast club. The group includes, reading from left to right, Mr. Stanford (Assistant Ground Engineer), Mr. Bevis, Mr. Capon, Mr. Dickson, Mr. McCracken (Chief Ground Engineer), Mr. H. R. Bound (Hon. Publicity Secretary), and Capt. G. I. Thomson, D.F.C. (Chief Instructor).

The Hampshire Aeroplane Club

REPORT for week ending February 18.—Total flying time, 6 hrs. 55 mins. Instruction flying, 2 hrs. 55 mins. Solo flying, 2 hrs. 55 mins. Test flights, 1 hr. 5 mins.

The following members had instruction:—The Hon. H. R. Grosvenor, 1 hr. 40 mins.; Capt. H. T. Molyneux, M.C., 40 mins.; Lieut. A. R. Cadell, R.N., 35 mins.

The soloists were Señor de la Cierva, 2 hrs. 35 mins.; K. P. L. Bowen, 5 mins.; R. H. Cooper, 5 mins.; Lieut. Cadell, R.N., 5 mins.; and the Hon. H. R. Grosvenor, 5 mins.

Fog prevented flying on four days of the week, but advantage was taken of the fact that visibility improved on Friday to send off two more soloists, viz.: Lieut. A. R. Cadell, R.N., and the Hon. H. R. Grosvenor. Incidentally, Grosvenor beat the club's record for shortest period of instruction, as his total time for dual was $5\frac{1}{2}$ hours from the time of his first passenger flight. The rule of the club is that no pupil must be sent off with less than 6 hours instruction, but Captain Thomson was satisfied that this pupil was perfectly safe. One other fact is worth recording about the Hon. Grosvenor, and that is, he has been having most of his instruction with his left arm in a sling, the result of a fall whilst steeplechasing recently.

Weather permitting, we shall be at Norwich on Friday, the 25th, to take part in the meeting in connection with the formation of the East Anglian flying club.

THE HAMPSHIRE AIR PAGEANT

AN ambitious and original Aerial Pageant is being organised by the Hampshire Aeroplane Club—the youngest of our six light 'plane clubs—regarding which we are able this week to give a few brief preliminary particulars. This event, which is to be held at the Southampton Aerodrome, Hamble, on Sunday, May 15 next, will be the first amphibious air display ever organised for landplanes; seaplanes and flying boats are to take an active part in the afternoon's programme.

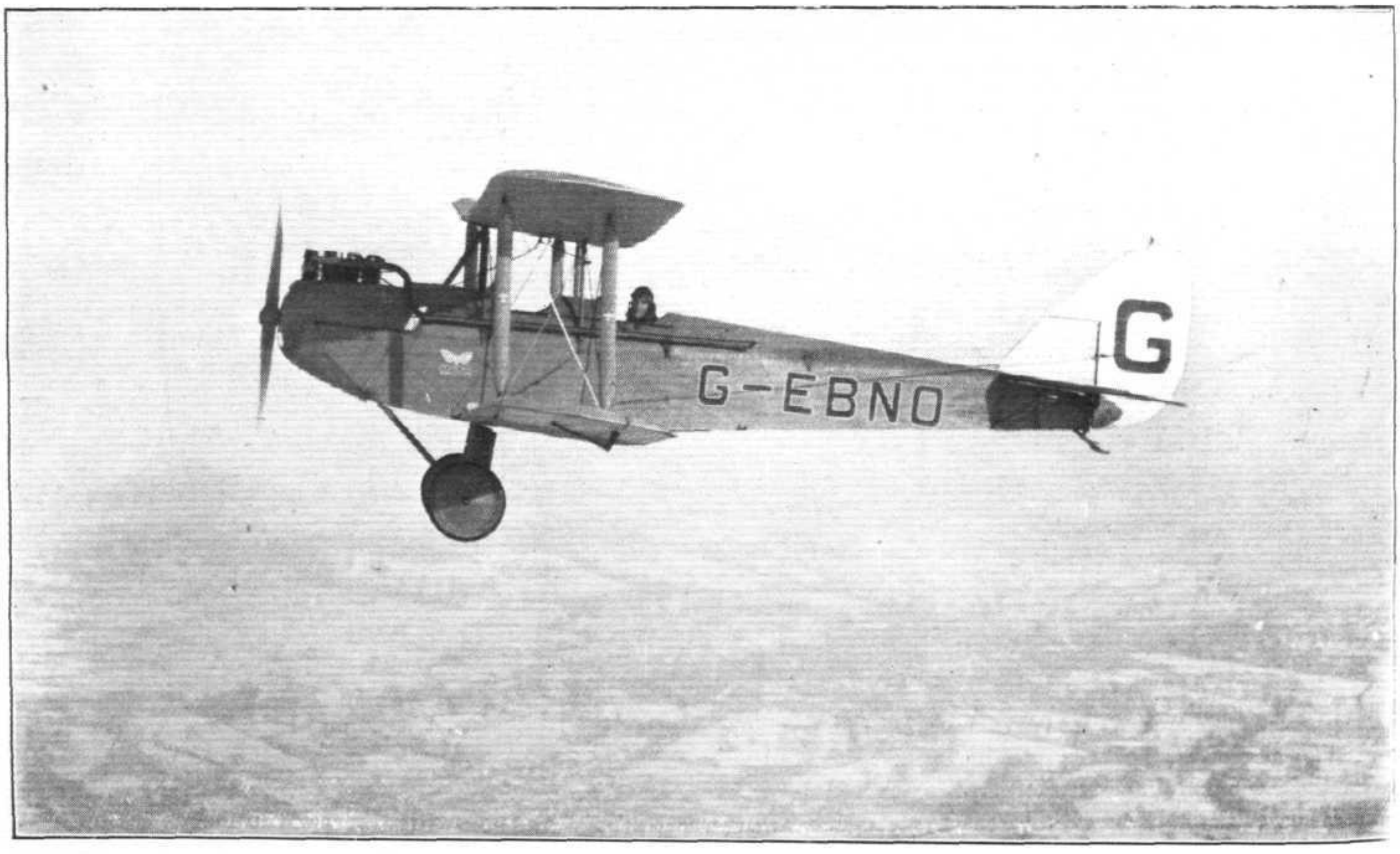
By kind permission of the Air Council, exhibition flights will be given by Supermarine "Southampton" flying boats, and Hawker "Woodcock" single-seater fighters. Proceedings will open at 2.30 p.m. with a "fly past" of the most recent types of aircraft, after which there will be a full programme of racing and exhibition flying. Perhaps one of the most interesting of these events will be a race for light aeroplanes specially arranged to demonstrate the ease with which the owner-pilot's machine may be handled, both on the ground and in the air. Other events include scratch and handicap races for all types of aircraft, the prize-list for which comprises both valuable trophies and large sums of money.

Arrangements will be made to provide adequate accommodation for some 25,000 people, and every effort will be made to ensure their comfort in travelling to and from the flying ground. The Southern Railway has decided, we understand, to grant half-fare facilities to all spectators, and also to run special trains to the aerodrome from London and other chief centres. In addition to the train services, motor services from all parts of the South of England, and special steamers from the Isle of Wight and Southampton district will convey visitors direct to the aerodrome, or within five minutes' walk of it.

A musical programme has been arranged, whilst tea and light refreshments will be provided in all enclosures, a first-class luncheon being served from noon onwards. The aerodrome will be open to the public at 12 noon, and prices for admission will be 5s., 2s. 6d., and 1s. (cars, 2s. 6d.). Further details of this pageant will be announced later, and in the meantime we are asked to state that it is being organised in sections, and all correspondence relating to the pageant should be addressed to the appropriate section, Hampshire Air Pageant, Hamble, Southampton; viz.—Enclosures; Traffic and Police; Publicity; Tickets; Entries; Bands and Wireless; Refreshments; Transport; Programme; Finance; and Engineering.

The Bristol and Wessex Aeroplane Club

WE referred in our last issue to the admirable ambition and preliminary efforts of Norwich to form its own light aeroplane club, and now we are pleased to hear of a similar movement in Bristol. It is so far advanced that very shortly it will be registered as an existing club known as the Bristol and Wessex Aeroplane Club, with His Grace the Duke of Beaufort as patron, and the Lord Mayor and other eminent local personages of Bristol as active supporters. The aerodrome will be within easy access of Bristol, and as soon as it is located, one 'plane will be ordered. The organisation will be on similar lines to those in the six senior clubs, who are generously giving their assistance, together with the department of the Air Ministry concerned. Already a wide public interest has been evinced, but as is pointed out, this was expected from Bristol, which has figured so prominently and worthily in the progress of aviation, particularly with its latest product the "Jupiter" engine. All who are interested should communicate with the organising secretary, *pro tem.*, Mr. C. S. Clarke, Channel Road, Walton Park, Clevedon, Somerset.



["FLIGHT" *Photograph*

FLYING IN 1909 AND STILL GOING STRONG: Capt. Geoffrey de Havilland, one of our pioneer designers and pilots, still flies whenever there is an opportunity. He is here seen on one of the "Moths," having a look at the recent snow from above.

The AIRCRAFT ENGINEER

FLIGHT ENGINEERING SECTION

Edited by C. M. POULSEN

February 24, 1927

CONTENTS

OUR CONTRIBUTORS

Mr. H. R. Mettam, who is Chief of the Stress Department of the Westland Aircraft Works, Yeovil, contributes to the present issue an article on "Comparison of Aircraft Performances." The article is really in reference to our translation of Prof. Everling's article on "Comparative Quantities in Aircraft Statistics," which was published in our November 25, 1926, issue. The article has for its object the derivation of the "Everling quantities" in British symbols and units and the correlation of them with methods of performance comparison already in use in this country.

There can be no doubt that the use of unfamiliar symbols and units is a prolific cause of irritation, and may often result in the total disregard of an article or paper on that very score, and for that reason we are extremely glad to have Mr. Mettam's article, which should do much towards helping those of our readers who may have been "put off" by the strange symbols and units used in the original article to a better understanding of Prof. Dr. Everling's arguments. At the same time, as we pointed out in our introduction to the article in the November 25 issue, the "Everling Quantities" are intended for comparison between various machines, not only our own machines between each other, but between British and foreign aircraft. That being so, it is surely better to "standardise" the units in such a way that the same units can be employed in all countries. As Prof. Everling first suggested the quantities, and as the continental system is fairly widely adopted, we considered it logical to retain the original units and symbols in the translation of his article.

Mr. F. M. T. Reilly deals with the subject of "Fineness," and draws attention to the importance of careful design. He throws a good deal of blame upon bodies, and illustrates some which do certainly not appear to be perfectly streamlined. At the same time it is, we think, only fair to bear in mind the fact to which Mr. North has referred, *i.e.*, that the question of body shape is largely out of the hands of the aircraft designer, who has to provide a machine in or on which certain loads of a certain nature have to be carried.

Mr. J. D. North has sent us a further instalment, but as the material, and more particularly the illustrations, arrived too late, it has not been possible to include the article. It will be published next month.

COMPARISON OF AIRCRAFT PERFORMANCES.

By H. A. Mettam, M.A., A.F.R.Ae.S.

In view of the Editor's decision to make use of the "Everling quantities" when describing British and foreign aircraft in Flight, it is of interest to derive these quantities in British symbols and units, and to correlate them with methods of performance comparison already in use in this country. For a full description of the Everling quantities reference should be made to the article by Prof. E. Everling on "Comparative Quantities in Aircraft Statistics," as translated in The Aircraft Engineer for November 25, 1926. The names suggested therein, "high-speed," "distance" and "altitude" figures will be used, together with the expression "wing-power" which will be measured in the British units of horse-power per square foot of wing surface.

The three quantities which measure the aerodynamic merit of the aircraft for the requirements of high speed, distance or altitude are defined by Prof. Everling, in non-dimensional forms. The only change to be made when using British symbols is due to the fact that the German coefficients for lift and drag—Ca and Cw—are double the English coefficients k_l and k_d. It is, therefore, very simple to define the three required quantities in British symbols so that they will be directly comparable with the quantities given by Prof. Everling in German symbols.

If η is the propeller efficiency and k_l and k_d the lift and drag coefficients, these definitions become—

$$\text{"High-speed" figure} = \frac{\eta}{2k_{\mathrm{D}}}$$

$$\text{"Distance" figure} = \eta\,\frac{\mathrm{L}}{\mathrm{D}}$$

$$\text{"Altitude" figure} = \eta\,\frac{\mathrm{L}}{\mathrm{D}}\cdot\sqrt{2k_{\mathrm{L}}}$$

Each of these figures can be derived from the standard equations for level flight as in Prof. Everling's article, and the resulting formulæ are given below—

$$\frac{\eta}{2k_{\mathrm{D}}} = \frac{\mathrm{V}^3}{147000} \times \frac{\mathrm{S}}{\mathrm{HP.}} \times \frac{\sigma}{f(h)}$$

$$\eta\,\frac{\mathrm{L}}{\mathrm{D}} = \frac{\mathrm{V}}{375} \times \frac{\mathrm{W}}{\mathrm{HP.}\,f(h)}$$

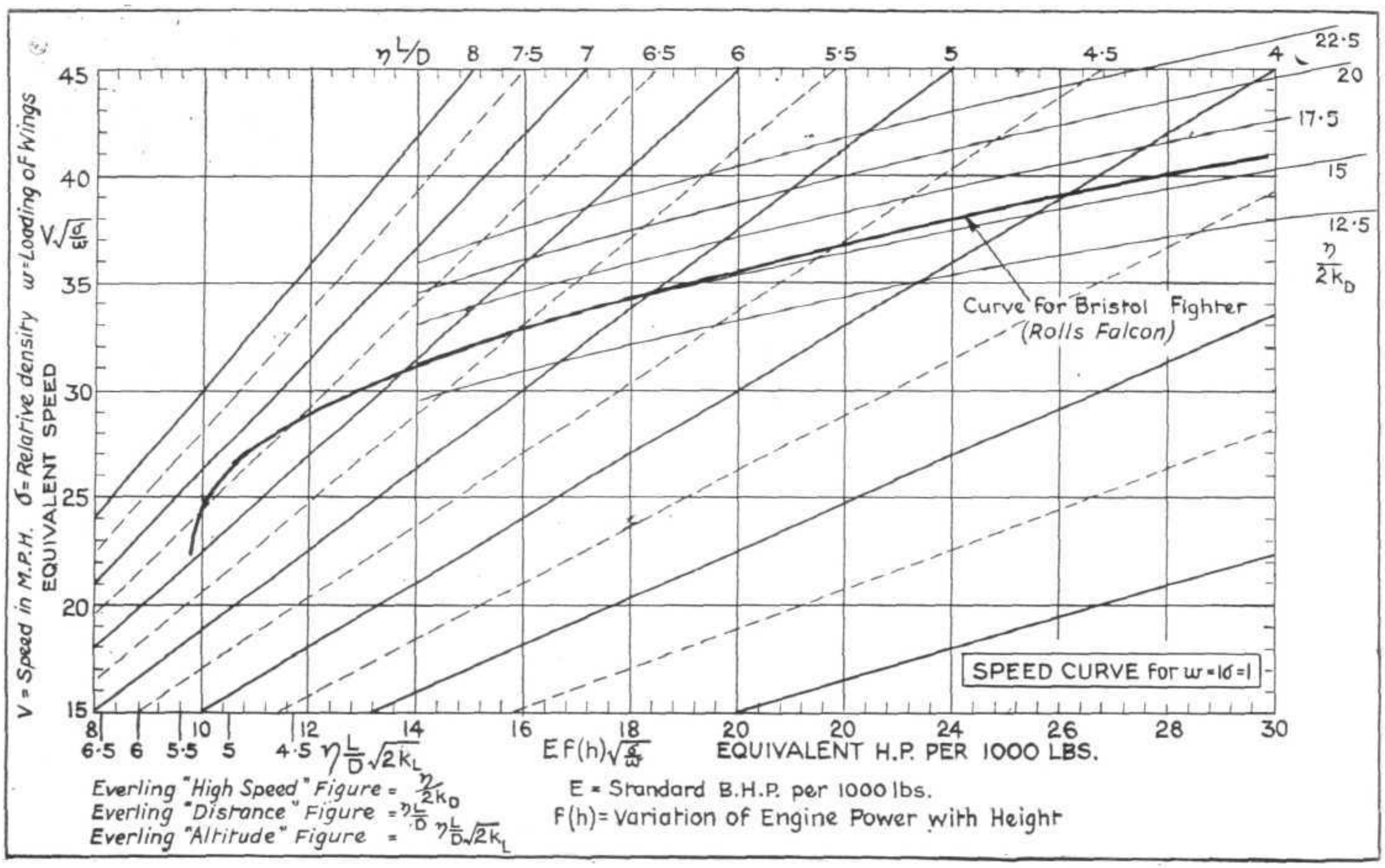
$$\eta\,\frac{\mathrm{L}}{\mathrm{D}}\sqrt{2k_{\mathrm{L}}} = \frac{1}{18{\cdot}95} \times \frac{\mathrm{W}\sqrt{\omega}}{\mathrm{HP}\cdot f(h)\sqrt{\sigma}}$$

The symbols used are defined below—

V = speed in m.p.h.
S = wing surface in sq. ft.
W = weight of machine in lbs.
ω = wing loading in lbs. per sq. ft.
σ = relative density of the air.
$f(h)$ = factor for variation of engine power with height.

It is clear that values of the three Everling quantities can be calculated from any set of level flight performance records at any height, but it does not follow that the figures so obtained will have optimum values. The true maxima for a given aircraft can, however, be obtained accurately by the method to be described if sufficient performance data are available. The information required includes true measured top speeds in level flight for a wide range of different heights, ceiling, where top speed and climb conditions become coincident. From the speed and engine r.p.m. at the ceiling so determined a point can be calculated which will be the lower limit of the reduced speed curve. If it is desired to extend the curve at the top speed end, Capt. Coales shows that it is reasonable to assume that the drag coefficient k_d is constant at its minimum value and the propeller efficiency η is constant at its maximum value. With these assumptions the reduced speed curve becomes a cubic of speed against h.p. per 1,000 lbs., and may be produced on this law for a short distance only beyond the highest speed point available from test data.

If the Everling quantities are to be determined from the Coales curve it is necessary to express them in terms of the "reduced" speed $V\sqrt{\frac{\sigma}{\omega}}$ and the "reduced" h.p. per



with the engine r.p.m. corresponding to each speed, a curve of engine b.h.p. against r.p.m. at ground level, and the law of variation of b.h.p. at heights compared to that at ground level.

For a full description of the method to be employed, reference should be made to R. & M. 608, "Reduction of Aeroplane Performance Trials for the purposes of Aerodynamic Comparison and Prediction," by Capt. J. D. Coales, D.Sc. In this report Capt. Coales suggested the use of a "reduced" speed curve, in which speed is plotted against "horse-power per 1,000 lbs." after both these quantities have been reduced to the values they would have if the wing loading of the machine, and the relative density σ, were both unity. The quantities actually plotted on a Coales speed curve are $V\sqrt{\frac{\sigma}{\omega}}$ and $E f(h)\sqrt{\frac{\sigma}{\omega}}$ where E denotes h.p. per 1,000 lbs.

If top speed tests have been made at several heights the points obtained will, when "reduced," lie on a curve of the type shown in the graph. To complete the curve at the left-hand, *i.e.*, low speed end, it is necessary to find the ceiling point. The values of speed and engine r.p.m. at the ceiling can be obtained by producing the curves of these quantities against height obtained from the performance trials. If values from climbing trials are also available, curves plotted from them should also be produced to the

1,000 lbs., $E f(h)\sqrt{\frac{\sigma}{\omega}}$. The formulæ so transformed become—

$$\frac{\eta}{2k_D} = \frac{1}{147} \times \frac{\left(V\sqrt{\frac{\sigma}{\omega}}\right)^3}{E f(h)\sqrt{\frac{\sigma}{\omega}}}$$

$$\eta\frac{L}{D} = \frac{1}{\cdot 375} \times \frac{V\sqrt{\frac{\sigma}{\omega}}}{E f(h)\sqrt{\frac{\sigma}{\omega}}}$$

$$\eta\frac{L}{D}\sqrt{2k_L} = \frac{52\cdot 8}{E f(h)\sqrt{\frac{\sigma}{\omega}}}$$

From the second equation, it is evident that straight lines can be plotted on the speed chart for constant values of $\eta\frac{L}{D}$. This plan was adopted by Capt. Coales and described in R. & M. 608. An extension of his method can be made to include the plotting of lines showing constant values of

$\eta/2k_D$ and of $\eta \frac{L}{D}\sqrt{2k_L}$. The former set will be cubic curves, and may be compared with Capt. Coales's method for extending the top speed end of the curve, while the latter are vertical straight lines. (For clearness in the figure given, the $\eta/2k_D$ lines are plotted over the high speed end of the diagram only, while the vertical lines are marked on a special scale but not drawn in.)

This modified form of the Coales speed chart may now be used for plotting the results of a machine performance trial. The top speed end of the curve will approximate to one of the family of cubic curves, thus determining the optimum value of the Everling "high speed" figure. One of the $\eta \frac{L}{D}$ lines will be tangential to the curve at some value of $V\sqrt{\sigma/\omega}$, thus giving the maximum Everling "distance" figure and the best value of "reduced" speed at which the aeroplane must fly for economical cruising.* The ceiling point must lie on a vertical line corresponding to the true optimum value of the Everling "altitude" figure.

All the three quantities can, therefore, be accurately determined by plotting this one curve on the suitably prepared chart. An examination of the Everling curves as shown on the chart shows that the Everling quantities express, in numerical form, the fact that one machine is aerodynamically more efficient than another for all conditions if its "reduced" speed curve on the Coales chart lies above and to the left of that for the other machine.

When Coales curves are available for various machines, these can be compared throughout their speed range either by plotting on one sheet, or by the use of transparent forms which can be superimposed, but this method becomes cumbersome for more than a very few machines, so that the Everling quantities become very useful as figures of merit showing three important points on the curves.

If, in addition to knowing the Everling quantities, we know the optimum values of K_L

$$\left[\text{or } V\sqrt{\sigma/\omega} \text{ since } K_L = \frac{196}{(V\sqrt{\sigma/\omega})^2}\right]$$

to which each quantity corresponds, we have sufficient points and tangents to enable us to draw the complete Coales curve with considerable accuracy. In the absence of this knowledge caution is necessary in using the Everling quantities for performance prediction, as it may not be possible to develop the maximum values of the "high speed" figure or "distance" figure under the new conditions assumed.

Some interesting information on the variation of the "high speed" figure for different conditions can be obtained from the article on "Speed Estimates and Handicapping" published in FLIGHT of April 15, 1926.

The formula for top speed recommended for handicapping in air races is $V = F\sqrt[3]{\omega/\lambda}$, where λ = lbs. per h.p., and F is given by a curve plotted against $V\sqrt{\sigma/\omega}$. The quantity under the cube root will be recognised as the "wing power" as defined in Prof. Everling's article $\left(\frac{\omega}{\lambda} = \frac{W/S}{W/HP} = \frac{HP}{S}\right)$

The formula for $\eta/2k_D$ can be re-written—

$$V^3 = \frac{\eta}{2k_D} \times 147000 \times \frac{\sigma}{f(h)} \times \frac{S}{HP}$$

$$\text{or } V = \sqrt[3]{\frac{\eta}{2k_D} \times 147000 \times \frac{\sigma}{f(h)}} \times \sqrt[3]{\frac{S}{HP}}$$

By comparison between the two formulæ we see that

$$F = \sqrt[3]{\frac{\eta}{2k_D} \times 147000 \times \frac{\sigma}{f(h)}}$$

If the height of flight is not very great we may put $\frac{\sigma}{f(h)} = 1$, and we get the Everling "high speed" figure equal to $\frac{F^3}{14700}$. Its value from the curve given in FLIGHT varies from 15·65 at $V\sqrt{\sigma/\omega} = 70$ to 7·2 at $V\sqrt{\sigma/\omega} = 22$. If $V\sqrt{\sigma/\omega} = 43·5$ be taken as representing the Bristol Fighter at top speed at ground level, the corresponding Everling figure given by the curve is 13·95. This may be compared with the actual value given below. It should be remembered that, as pointed out in the article quoted, the curve tends to underestimate speeds. This curve was actually derived by Capt. Coales by using values of η/k_D found by analysing performance tests of numerous machines on the basis described in R. & M. 608.

It is of interest to note the comparison between the Everling "altitude" figure and the formula for ceiling given in Bairstow's "Applied Aerodynamics," p. 404. This formula in present symbols is $f(h)\sqrt{\frac{\sigma}{\omega}} = \frac{·010\,W}{HP}$ where the horse-power used is the maximum ground level value, which corresponds to a fictitious Everling figure, based on the same H.P., of 5·28. The true figure would be larger, as the Bairstow formula makes allowance for the falling off of engine revolutions with height.

A typical curve is plotted in the figure given which is based on tests of a Bristol Fighter with Rolls-Royce "Falcon" engine (see R. & M. 983). The maximum value of $\eta/2k_D$ is by interpolation between the curves 15·7. The maximum value of $\eta L/D$ is 6·6, and the maximum value of $\eta \frac{L}{D}\sqrt{2k_L}$ from the ceiling point is 5·4.

Attention has been called in the article on Paris Show machines in THE AIRCRAFT ENGINEER of December 30, 1926, to the danger of calculating the Everling quantities from insufficient data, as, for example, by using ground level rated b.h.p. and standard h.p. variation laws. If, however, it is desired to compare two machines of very similar type with non-supercharged engines, it may be reasonable to assume that the falling off of engine r.p.m. and b.h.p. with height are proportionately the same for both machines. In such a case the Everling quantities may be calculated from rated b.h.p., but in general it is most desirable to use the detailed method of analysis described above.

* All considerations of the effect of height and throttling on engine consumption are ignored for present purposes. See Everling's article.

FINENESS.

By F. M. T. REILLY, A.M.I.A.E., A.M.I.Ae.E., A.M.I.P.

In the course of an investigation recently made, in which it was required to compare various machines by plotting an overall L/D against the machine's ceiling, it was instructive to note the superiority of the Junkers G.24 L., three-engined thick-wing monoplane, and of some American bi-

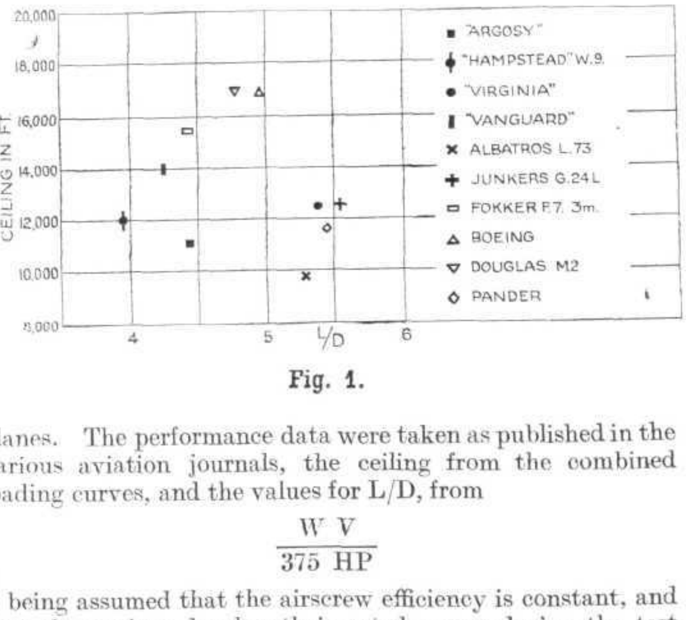


Fig. 1.

planes. The performance data were taken as published in the various aviation journals, the ceiling from the combined loading curves, and the values for L/D, from

$$\frac{W\,V}{375\ HP}$$

it being assumed that the airscrew efficiency is constant, and that the engines develop their rated power during the test for the top speed of the machine.

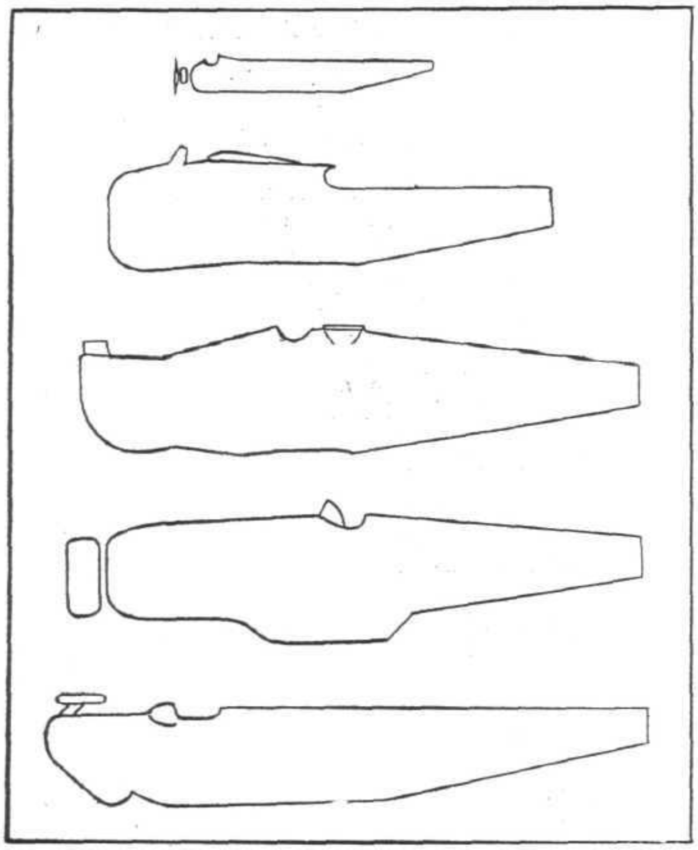


Fig. 2.

Taking it as an accepted fact that the primary function of a commercial 'plane is to transport a weight over a distance in the shortest time and for the least money, it matters little to the commercial man whether it be a monoplane or a biplane. To the designer, however, the maintenance costs for the biplane are likely to be larger, due to having, amongst other things, to keep up a staff of expert "riggers" (a charge upon the debit side, when in competition with a firm quoting a monoplane service) and there are some that will tell one that a biplane must necessarily present greater difficulties to the designer, in the direction of reducing head-resistances and improving the "fineness," due to the essential external members of the normal biplane design.

That this is not so, and that, by skilful design the two types can be brought into line, is fairly clearly illustrated by the comparison herewith, between the Junkers G.24 L., the Pander Sesquiplan, and the Vickers "Virginia," where the ceiling in each case is about 12,000 ft., with an L/D = 5·58; 5·44; and 5·36, respectively, showing real skill in the design of the two types. Perhaps it would be more correct to say the three types, for we have in comparison here a large monoplane, a large biplane and a machine that is half-way between the two, and is in addition in the "light plane" class. Of the three, the Pander is probably the most interesting, being a two-seater with a single engine of 45 h.p.; though considerable skill must have been required to produce such a structural design as the "Virginia," within a ratio of 1 : 5·36.

Remembering that the Fokker firm has recently received orders for machines for use in America, it is enlightening to compare the L/D and ceiling of this machine, with the two skilful "Mail plane" biplane designs by the Boeing and the Douglas companies of America. Note that the ceiling of the Fokker is some 15,500 ft., with an L/D = 4·4., and that the American biplanes have a ceiling of some 4,000 to 4,500 ft., higher than we design for in this country, and that in addition, they attain L/D values of 5·0 and 4·8 respectively.

As has already been said, some light can be thrown upon one of the reasons for the low values of L/D for many English designs, by a study of their bodies, and if comparison is made between the outline of the racing American machines as an ideal, with those of the well known commercial machines, and the one or two Service machines shown in Fig. 2, one cannot fail to note what truly wasteful bodies they must be.

Perhaps one might point out that with a machine like the Junkers, for 1·33 lbs. saved in resistance, approximately 1·0 gallon more petrol can be carried; with its consequent increase in range, and that the advantage increases as the process is continued. Or again, one might compare the flying costs of the Junkers with a machine like the "Hampstead," where the former carries 10 passengers for 264 lbs. of petrol per hour, or 0·242 lb. per passenger mile, while the latter absorbs 0·27 lb. per passenger mile—taking the consumption per horse-power to be the same for the two engines—which figures are, of course, equivalent to 0·41 lb. per ton-mile, and 0·58 lb. per ton-mile, upon the total weight of machine. We see, therefore, that as the Junkers has a value for L/D = 5·58, the cost of keeping the machine in the air, compared with the "Hampstead," whose L/D = 3·9, is approximately in the inverse proportion, or as 3·9/5·6 per unit.

It would seem, therefore, that more attention is needed in the external design of the bodies of the machines, possibly more care with regard to the selection of wing sections, the elimination of all external projections—be they upon the body, or the wings—that are not absolutely essential, and

MACHINE	DESCRIPTION	TOTAL WEIGHT IN LBS.	H.P.	W/H.P.	W/A	SPEED IN M.P.H. QUOTED	SPEED IN M.P.H. CALCULATED	L/D	APPROX. AB. CEILING IN FEET	GRAPH REF.
ARGOSY	LARGE NORMAL DESIGN OF 3 ENGINED BIPLANE	17500	1150	15·2	9·3	110	108	4·45	11,000	■
HAMPSTEAD. W.9.	" " "	14500	1155	12·55	9·28	117	116	3·92	12,000	♦
VIRGINIA	LARGE NORMAL DESIGN OF 2 ENGINED BIPLANE	16750	900	18·65	6·62	108	90	5·36	13,000	●
VANGUARD	" " "	18500	1300	13·3	8·5	112	108	4·25	14,000	▮
ALBATROS, L73.	" " "	10142	460	22	9·75	90	93	5·3	9,850	✖
JUNKERS, G24.L	THICK WING 3 ENGINED MONOPLANE.	13205	690	19·15	13·8	109	109	5·56	12,500	✚
FOKKER, F VII	" " "	7950	600	13·3	12·6	125	125	4·42	15,500	▭
BOEING	SINGLE ENGINED, SINGLE SEATER, NORMAL BIPLANE	5495	400	13·71	10·05	135	122	4·94	17,000	△
DOUGLAS, M2	" " "	4968	400	11·8	12	145	135	4·8	17,000	▽
PANDER	SINGLE ENGINED, TWO SEATER SESQUIPLAN.	1180	45	26	6·2	78	81	5·45	11,500	◇

Fig. 3.

perhaps not least, undercarriages that are for service at an altitude as well as on the ground. It is well to remember that "fineness" is synonymous with "economy," and that it is a point open to much debate whether the un-economical design pays back the disadvantage in other ways, such as improved cabin accommodation, or slightly improved view, etc., and with regard to such doubtful advantages as a high top speed regardless of efficiency, it is worth while to note that the Fokker F. VII-3m. is now fitted with three "Lynx" engines of 180 h.p. each, in place of the three Wright "Whirl-

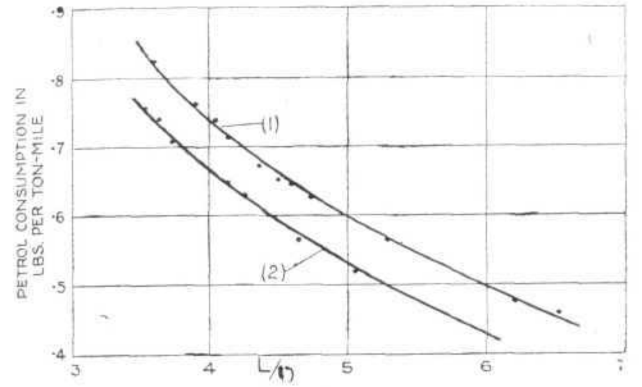


Fig. 4.

wind" engines of 200 h.p. each, the result being a total reduction of 60 h.p., a loss of 10 miles per hour at sea-level, an improved L/D, viz., 4·52, an increase in radius, and a reduction in the cost per ton-mile.

The approximate relationship between this ton-mile consumption and the L/D is given by the curves shown in Fig. 4, that have been derived from the formulæ

(1) Water-cooled engines (0·50 lbs. per h.p.-hr.)

$$\text{Petrol consumption in lbs. per ton-mile} \ldots = \frac{1120\ \text{HP}}{\text{W V}}$$

(2) Air-cooled engines (0·45 lbs. per h.p.-hr.)

$$\text{Petrol consumption in lbs. per ton-mile} \ldots = \frac{1009\ \text{HP}}{\text{W V}}$$

It may be as well to draw attention to the variability of consumption with different engines, and to mention that the figures given above represent the average for six engines in each class.

TECHNICAL LITERATURE.

SUMMARIES OF AERONAUTICAL RESEARCH COMMITTEE REPORTS.

ACCIDENTS TO AEROPLANES INVOLVING FLUTTER OF THE WINGS.

REPORT OF THE ACCIDENTS INVESTIGATION SUB-COMMITTEE.

R. & M. No. 1041 (A.3) (19 pages and 15 diagrams). December, 1925. Price 1*s*. 3*d*. net.

The problem of flutter in aeroplane parts is likely to become of increasing importance as the speed of aeroplanes is increased, and some of the occurrences affecting flutter of the wings were referred to the Accidents Sub-Committee for investigation.

The whole problem of flutter and vibration in aeroplanes has proved to be a much more complex problem than was at first realised, and a general investigation has been started which will take more than a year to complete.

Some definite conclusions were reached at an early stage in the investigation, and these have been put together in the present Report. The aeroplanes in question (which are not now used in the Royal Air Force) developed an unusual amount of oscillating movement of the wing tips of considerable magnitude accompanied by excessive vibration of the whole machine. The apparent movement of the wing tips was about an inch at rates which have been estimated between 400 to 1,000 per minute. It would appear that there are various means of overcoming the vibration difficulty or of postponing its occurrence to a higher speed, as, for example, (1) by the movement of the point at which aileron is controlled; (2) by arranging that the C.G. of the aileron should be on the hinge; (3) by an attachment designed either to limit the motion of the spar or to increase its stiffness.

Some theoretical work on the subject, and some of the conditions as reproduced experimentally at the Royal Aircraft Establishment are reported in appendices.

ON THE EQUIVALENCE BETWEEN THE DYNAMICAL SYSTEM OF A MULTI-CRANK FLYWHEEL SYSTEM AND A CERTAIN ELECTRICAL CIRCUIT, WITH SOME SUGGESTIONS FOR MEASURING CRITICAL SPEEDS AND SHAFT STRESSES BY ANALOGY.

By E. B. MOULLIN, M.A.

R. & M. No. 1045 (E. 21) (9 pages and 5 diagrams). April, 1926. Price 9*d*. net.

Breakages of the crankshaft of large aeroplane engines have occurred, and on account of their complication and relative lightness compared with other heavier engines, existing methods of analysis have to be modified to find and avoid critical speeds, and for the calculation of stresses. Another attack on the problem can be directed experimentally, as is suggested in the present paper.

It is known that if the equivalent inertia of the rotating masses and the equivalent stiffness of the portions of the shaft can be stated, then the critical frequency can be calculated. A simple method of avoiding the calculation is to devise an electrical circuit equivalent to the dynamical system, and the author has shown how this can be done. An extension has been proposed to include the case of variable inertia, and also the case of a couple acting on each crank. Some suggestions are added for suitable sizes of the moments of inertia of the system.

SLOT AND AILERON CONTROL ON A WING OF R.A.F. 31 SECTION WITH VARIOUS TYPES OF AILERONS.

By F. B. BRADFIELD, Maths. and Nat. Sci. Trip., and A. S. HARTSHORN, B.Sc.

Presented by the Director of Scientific Research.

R. & M. No. 1048 (Ae. 234). (16 pages, 10 diagrams). May, 1926. Price 1*s*. net.

The slot and-aileron control has been previously fitted to an Avro with standard and balanced ailerons (R. & M. 916)* and also tested on the R.A.F. 15 section (R. & M. Nos. 1008† and 1047).‡ Model experiments on the same control are described in the present report as fitted to a wing of R.A.F. 31 section intended for use on a Bristol Fighter aeroplane; for performance measurements on this wing section reference should be made to R. & M. 990.§

Rolling and yawing moments were measured from $\alpha = 0°$ to 30° incidence, on R.A.F. 31 with slot control, with symmetrical balanced, Frise balanced, and slotted ailerons. Aileron hinge moments were measured for the symmetrical balanced, Frise balanced and slotted ailerons. Hinge moments of the auxiliary aerofoil forming the slot control were also measured. The additional drag due to the slot was determined.

Rolling and yawing moments were measured on a 6·6-in. chord model, hinge moments on a 13·2-inch model, both at V = 60 ft./sec.

R.A.F. 31 section is not adapted to this type of auxiliary aerofoil; the increase of drag is too great. But Frise balanced or slotted ailerons without slot control give good results on the model if used to large angles. The scale effect on R.A.F. 31 near stalling is very large, and no deductions can be made as to full scale stalling conditions.

* R. & M. 916.—Slot control on an Avro, with standard and balanced ailerons.—F. B. Bradfield.

† R. & M. 1008.—Wind channel tests of slot-and-aileron control on a wing of R.A.F. 15 section.—F. B. Bradfield, A. S. Hartshorn and L. E. Caygill.

‡ R. & M. 1047.—Model tests of a combined slot-and-aileron control on a wing of R.A.F. 15 section. Push forward type of auxiliary.—F. B. Bradfield and A. S. Hartshorn. Presented by the Director of Scientific Research.

§ R. & M. 990.—Full scale and model measurements of lift and drag of Bristol Fighter with R.A.F. 31 wings.—B. D. Clark, B.Sc., and R. G. Harris D.Sc.

Rolling and yawing moments are to be measured on a 13·2 in. chord model at wind speeds up to 120 ft./sec., to determine the rate of change of these moments with scale.

THE DIRECT MEASUREMENT OF THE ANGLE OF FLIGHT PATH OF AN AEROPLANE AS A MEANS OF ELIMINATING THE EFFECT OF AIR CURRENTS ON THE MEASUREMENT OF LIFT AND DRAG.

By E. T. JONES, M.Eng., and H. L. STEVENS, B.A. Presented by the Director of Scientific Research.

R. & M. No. 1049 (Ae. 235). (7 pages and 4 diagrams.) August, 1926. Price 9d. net.

In making performance measurements there has always been some difficulty due to the up and down currents that are present in the atmosphere. These currents result in the scattering of the observations obtained during full-scale testing, and the elimination of their effect would largely increase the accuracy of such work and also allow the work to be carried out in less settled weather.

A suspended instrument to record the true angle of the flight path independently of atmospheric currents has been made and fitted to a Bristol Fighter. A number of glides have been carried out both by the standard method and with the instrument in use. The scattering of the observations was considerably reduced with the aid of the instrument, and the results were also obtained more quickly. The flight path recorder will be used in all further work of this nature, and a lighter instrument, suitable for quick transference from one aeroplane to another, is being designed. The instrument will also be used to check the circulation theory by exploring the flow at various depths below the aeroplane.

FULL SCALE AND MODEL MEASUREMENTS OF LIFT AND DRAG OF BRISTOL FIGHTER WITH R.A.F. 30 WINGS. PART I.—FULL SCALE. PART II.—MODEL EXPERIMENTS. PART III.—COMPARISON OF MODEL AND FULL SCALE RESULTS.

By A. E. WOODWARD NUTT, B.A., R. G. HARRIS, D.Sc., and L. E. CAYGILL, B.Sc., A.M.I.M.E.

Presented by the Director of Scientific Research.

R. & M. No. 1052 (Ae. 237). (6 pages and 9 diagrams.) August, 1926. Price 6*d*. net.

A number of thick wing sections are being tested in flight and in a wind tunnel and recent experiments include tests on R.A.F. 30, 31,* and 32.† These are to be followed by tests on R.A.F. 34.

The lift and drag of a Bristol Fighter with wings of R.A.F. 30 section have been determined for the full-scale aeroplane and for a 1/10th scale model at speeds of 40, 60 and 90 ft./sec.

The maximum lift coefficient is considerably higher for the full-scale aeroplane than for the model, the increase being larger than that of either R.A.F. 31, or R.A.F. 32; the two sets of values agree up to 10° incidence, but the full-scale lift reaches 0·60 at $20\frac{1}{2}°$ and the model only 0·42 at about 15° with a wind speed of 90 ft./sec. The drag coefficient is slightly lower for the full-scale than for the model throughout the range with minima of 0·031 on full-scale and 0·032 at 90 ft./sec. on the 1/10th scale model.

Elevator angles and forces have still to be measured full-scale to verify the C.P. position.

* R. & M. 990. Full-scale and model measurements of lift and drag of Bristol Fighter with R.A.F. 31 wings.—B. D. Clark, B.Sc., and R. G. Harris, D. Sc.

* R. & M. 1055. Tests on Handley Page Aerofoil A.1. and R.A.F. 31.—Messrs. Handley Page, Ltd.

† R. & M. 1006. Full-scale and model measurements of lift and drag of Bristol Fighter with R.A.F. 32 wings.—E. F. Anderson and L. E. Caygill, R.A.E.

SECOND REPORT ON FULL-SCALE EXPERIENCE WITH THE SLOT AND AILERON CONTROL FITTED TO A BRISTOL FIGHTER.

By H. L. STEVENS, B.A. Presented by the Director of Scientific Research.

R. & M. No. 1051 (Ae. 236). (3 pages and 2 diagrams.) August, 1926. Price 4*d*. net.

In March, 1926, a preliminary report No. T. 2254 (unpublished) was issued, giving the experience obtained up to that time on the slot and aileron control as fitted to both planes of a Bristol Fighter aeroplane. It was concluded that the control had the features desired when the aeroplane was stalled, but that the feel in normal flight was unpleasant. The wind tunnel tests on this control are described in R. and M. 1008.

The present report describes the modifications carried out to improve the control in this respect and the results obtained. In particular, the effect of fitting the control to the top plane *only* was investigated.

With the control fitted to the top plane only, the bottom plane and ailerons being standard, and with the remaining slots having a 50 per cent. greater range of opening, the control is still adequate, and the feel is quite pleasant. The relative weakness of the rudder control is now very apparent and should be improved. The combination will probably considerably increase the aeroplane's fighting efficiency.

It was recommended as a result of this work that the large fin and rudder reported on in R. & M. 972 be fitted and the aeroplane allotted to a service squadron for a further report.

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AMERICAN NATIONAL ADVISORY COMMITTEE REPORTS.

The National Advisory Committee for Aeronautics in the United States of America corresponds to our own Aeronautical Research Committee. Two distinct classes of reports are issued, the first being known as *Technical Reports*. These Technical Reports are printed, and are illustrated by photographs and/or drawings. The second class are known as *Technical Notes*, and are issued in mimeographed form so as to enable them to be rapidly distributed to a somewhat smaller, but directly interested, circle of readers. Copies of the Reports and Notes may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D.C., U.S.A., but the American N.A.C.A. have a Technical Assistant in Europe, whose office is at 18, Rue Tilsitt, Paris, from whom copies can usually be obtained, thus saving a certain amount of time.

The average price of the Technical Reports is 10 cents, which is, of course, remarkably cheap in view of the information contained, and in some instances the price is as low as 5 cents.

Summaries of Technical Notes Published in 1926.

(*Continued from page* 12.)

PROPELLER DESIGN: EXTENSION OF TEST DATA ON A FAMILY OF MODEL PROPELLERS BY MEANS OF THE MODIFIED BLADE ELEMENT THEORY—II.—No. 236.

By FRED E. WEICK, Langley Memorial Aeronautical Laboratory.

This report is the second of a series of four on propeller design, and describes the method used to extend the data obtained from tests on a family of thirteen model propellers, to include all propellers of the same form likely to be met in practice. This necessitates the development of a method of propeller analysis which when used to calculate the powers and efficiencies gives results which check the tests throughout their range. Airfoil characteristics are derived from the model propeller tests themselves, and used in the single section method of analysis (given in the first of this series, N.A.C.A. Technical Note No. 235) to calculate the powers and efficiencies for propellers outside of the test range.

PROPELLER DESIGN : A SIMPLE SYSTEM BASED ON MODEL PROPELLER TEST DATA—III.—No. 237.

By Fred E. Weick, Langley Memorial Aeronautical Laboratory.

This report, the third of a series of four, describes a simple system for designing propellers of a standard form. In this report the system is based on tests of a family of model propellers of standard Navy form, the data from which have been extended by means of calculations to cover the complete range likely to be found in practice. However, it can be worked out for any family having propellers of one general form. This system can also be applied as given to propellers of different forms by means of form factors. Modifications are made for full-scale flight conditions, *i.e.*, the particular tip speed of the propeller, and body or fuselage interference.

PROPELLER DESIGN : A SIMPLE METHOD FOR DETERMINING THE STRENGTH OF PROPELLERS—IV.—No. 238.

By Fred E. Weick, Langley Memorial Aeronautical Laboratory.

The object of this report, the last of a series of four on propeller design, is to describe a simple method for determining whether the strength of a propeller of a standard form is sufficient for safe operation. An approximate method of stress analysis is also given.

STEAM POWER PLANTS IN AIRCRAFT.—No. 239.

By E. E. Wilson, Bureau of Aeronautics, Navy Department.

The employment of steam power plants in aircraft has been frequently proposed. This paper makes a brief analysis of the proposal from the broad general viewpoint of aircraft power plants, and the conclusion is reached that on the basis of the weight of the power plant alone, steam power plants for aircraft are precluded. On the basis of economy alone they are again precluded. On the basis of the resistance of the cooling surface required alone they are precluded. On the basis of the sum of these three considerations they are absolutely impossible.

THE N.A.C.A. CYH AIRFOIL SECTION.—No. 240.

By George J. Higgins, Langley Memorial Aeronautical Laboratory.

The N.A.C.A. CYH airfoil section is described and its aerodynamic characteristics are given as tested in the N.A.C.A. variable density wind tunnel at 20 atmospheres pressure. This section has a low drag, a high maximum lift, and a small travel of centre of pressure.

TESTS OF SEVERAL BEARING MATERIALS LUBRICATED BY GASOLINE.—No. 241.

By W. F. Joachim and Harold W. Case, Langley Memorial Aeronautical Laboratory.

This investigation on the relative wear of several bearing materials lubricated by gasoline was conducted at the Langley Memorial Aeronautical Laboratory, Langley Field, Virginia, as part of a general research on fuel injection engines for aircraft. The specific purpose of the work was to find a durable bearing material for gear pumps to be used for the delivery of gasoline and Diesel engine fuel oil at moderate pressures to the high-pressure pumps of fuel injection engines.

The bearing surfaces were prepared for test by scraping, and by wearing them in under load with the shafts. The bearings were then baked and weighed to within 0·003 grain on analytical balances. The bearings were held in rockers attached to the bottom of a gasoline tank and to a lever, and the loads imposed by weighing the lever. The tests were made with 0·5-in. diameter shafts turning at approximately 1,200 r.p.m., the shafts and bearings being immersed in gasoline. The wear was determined by baking and weighing the bearings after test.

Eighteen bearing materials were tested. These tests included determinations of the wear of two bearing materials at various loads with both machine steel and hardened tool steel shafts ; seizing load tests of 16 bearing materials ; and wear tests of 8 bearing materials, selected from the seizing load tests, at a load of 250 lb. per square inch, with hardened tool steel shafts. When a machine steel shaft was used, the seizing load for a commercial hard bronze was about 65 lb. per square inch, and for another commercial, but softer, more porous bronze, it was about 80 lb. per square inch. With a hardened tool steel shaft, the seizing load for the hard bronze was about 115 lb. per square inch, and for the soft bronze it was about 210 lb. per square inch. Special bearing bronzes, containing lead up to approximately 35 per cent. or graphite up to approximately 50 per cent., carried loads up to 500 lb per square inch, without seizing, though in all cases considerable wear occurred above a load of about 300 lb. per square inch. The wear obtained in the tests on the eight selected bearing materials ranged from 0·53 to 21·55 grains per million turns per square inch of bearing contact surface. The least wear was obtained with a hard alloy of graphite and powdered bronze pressed and sintered at high temperature.

It was found that, with a machine steel shaft, a hard bearing material had less wear below the seizing load than a soft bearing material. These results were reversed with a hardened tool steel shaft. Soft bearing materials and bearing alloys containing special anti-friction metal or graphite have higher seizing loads than hard bearing materials for either kind of shaft. These tests indicate that a porous bearing material, sufficiently hard to support the loads imposed and containing anti-friction materials and relatively hard crystals to minimize wear, will give durable service with a hardened tool steel shaft.

LECTURES AND PAPERS.

THE SUPERCHARGING OF AIRCRAFT AND MOTOR VEHICLE ENGINES.

The official secrecy surrounding much of the work that has been carried out on the problems of supercharging aero engines was responsible for certain shortcomings in the paper read by Mr. Roy Fedden on February 1 before a joint meeting of the Royal Aeronautical Society and the Institution of Automobile Engineers. These omissions can in no way be laid at the door of the lecturer, but are a result of circumstances as they obtain at the present time, and Mr. Fedden, who, as probably the great majority of our readers are aware, is the designer of the famous "Bristol" aero engines, remarked in the course of his lecture : "The author cannot refrain from expressing his regret on this matter, as he feels that, providing really confidential information is withheld, an open interchange of ideas must be of benefit to all concerned."

Mr. Fedden expressed his belief that within the next few years practically all classes of military aircraft engines would be supercharged as a matter of course. He suggested that by the standardization of supercharged engines on military aircraft :

"(1) It will be possible to obtain a better performance on scouts with a ground-boosted gear-driven blower engine of considerably smaller capacity than the naturally-aspirated engine used at present, with a consequent gain in the all-round efficiency of the machine.

"(2) That for the larger general-purpose machine supercharged engines throttled on the ground and opened out to full power at some predetermined altitude will provide greatly increased performance over any type of existing or oversize engine.

"(3) That for long-distance bombing machines operating at high altitudes, and when fuel consumption over long distances is of the utmost importance, there is an important field for the exhaust-driven turbo-compressor."

The lecturer also thought that as the art of supercharging advanced the mechanism would be applied as standard to commercial aircraft, with a consequent all-round increase in efficiency and reduction in fuel consumption. Most probably the supercharger would not be used continuously, but would be employed for mild ground-boosting to obtain maximum

power to take off, and the engine would then be used as a naturally-aspirated one on an economical position of the throttle curve.

The improvement in efficiency in constant-pressure Diesel engines by the addition of surplus air opened out a new field for the development of this type of engine for commercial aircraft, with the advantages of elimination of fire risk and much reduced cost of fuel.

Mr. Fedden's paper concluded with the following statement: "The subject of supercharging 2-stroke engines has been especially avoided, because this is a field quite by itself; the moment the 2-cycle engine is considered from the standpoint of supercharging, the whole problem, which previously appeared rather hopeless, becomes a very interesting one."

In the introduction to his paper, Mr. Fedden defined supercharging as "The filling of the cylinder during each cycle by mechanical means in the form of a pump, with a greater amount of charge than would be possible with natural aspiration. In effect, with a supercharger in action, the engine functions as though it were operating in a denser atmosphere."

The paper dealt, more or less briefly, with existing types of superchargers, which were classified under the following heads: The exhaust-driven turbo-compressor, the gear-driven turbo-compressor, the Roots blower, and positive-displacement compressors. Three main types of pump had been employed: the centrifugal fan (driven by exhaust turbo-compressor or by gearing) the Roots type, and the eccentric-vane type. The reciprocating piston pump was not practical for aircraft owing to its weight and size.

Certain engine problems arising out of supercharging were dealt with at some length, such as valve timing, the effect of blowers on crankshaft synchronous speed, effect of supercharging upon indicator diagrams, cooling of supercharged induction gases, engine cooling, thermal efficiency, adverse heat conditions, lubrication, noise.

Although it was not possible to go into detail, Mr. Fedden indicated the advantage to be dervived by supercharging aero engines by quoting certain figures relating to a supercharged Bristol "Jupiter." The additional weight of the supercharging equipment was 140 lbs. The ceiling of the machine was increased by 10,000 ft., and the speed at the ceiling of the unsupercharged machine was increased by over 40 m.p.h.

Reference was also made in the paper to ways and means of overcoming the loss of power of a normal engine at altitude, without introducing a compressor. Mention was made of: The oversize engine with normal compression ratio, designed to take in an increased charge at a specified altitude to compensate for the reduced air density, the engine being throttled at ground-level. The high compression-ratio engine, throttled on the ground, and opened out to full throttle at a pre-determined altitude. The high-compression engine with bi-fuel system, using, near the ground, anti-detonating fuel, such as power-alcohol, and changing over to petrol at a predetermined height. And the variable-timing engine in which a high compression-ratio was used in conjunction with a valve gear, allowing the valve timing to be varied while the engine was running, the ideal timing being obtained at a predetermined altitude. The first of these the lecturer considered impractical, as it involved a considerable increase in weight and drag, and simply entered the aircraft designer on a vicious circle. The other three Mr. Fedden considered as being usefulc ompromises only, as appreciably improved results were obtained with a thoroughly reliable and efficient supercharger system.

A lantern slide was shown illustrating the different powers at altitude with various types of compressors. Unfortunately, the graph is not available, but the following table gives the weights and fuel consumptions, taking the 450 "Jupiter" with 5·3 : 1 compression-ratio as standard, which were obtained with different types of blowers:—

(1) Standard "Jupiter" engine, 5·3 : 1 compression-ratio, 450 h.p. full ground-level power. Weight, 730 lbs. Fuel consumption, ·575 pints per b.h.p. per hour.

(2) "Jupiter" engine 5 : 1 compression-ratio. Gear-driven centrifugal blower. Ground-boosted. Weight, 785 lbs. Fuel consumption, 0·62 pints per b.h.p. per hour.

(3) "Jupiter" engine 5·3 : 1 compression-ratio. Gear-driven centrifugal blower. Throttled at ground. Weight, 770 lbs. Fuel consumption, 0·6 pints per b.h.p. per hour.

(4) "Jupiter" engine 5·3 : 1 compression-ratio. Exhaust-driven turbo-compressor blower. Throttled at ground. Weight, 870 lbs. Fuel consumption 0·59 pints per b.h.p. per hour.

(5) "Jupiter" engine 5·3 : 1 compression-ratio. Power plus eccentric-vane blower. Throttled at ground. Weight, 830 lbs. Fuel consumption, 0·6 pints per b.h.p. per hour.

THE THEORY OF THE AUTOGYRO

That the "Gyroplane" will always be slightly inferior to the aeroplane for top speed was the conclusion arrived at by Mr. H. Glauert, M.A., F.R.Ae.S., in his paper on "The Theory of the Autogyro," read before the Royal Aeronautical Society on January 20, 1927. It was pointed out by the lecturer that, in the "windmill" type of lifting surface, the line of action of the resultant force is always inclined backwards from the shaft, and in consequence the best lift-drag ratio of a windmill is inevitably worse than that of an aerofoil, for the line of action of the resultant force on an aerofoil is inclined forwards from the normal to the chord under favourable conditions. Mr. Glauert pointed out that in presenting the theory of the autogyro in the form of a lecture he was met with the difficulty that the mathematical expressions were of an involved character, and were unsuitable for reproduction on the screen or blackboard. He therefore decided to make no attempt to develop the mathematical analysis, but to devote his attention to the physical basis on which the analysis rested and to explain, as far as possible, any analytical results in terms of the physical facts which they represented.

Taking the "solidity" of the windmill as

$$\sigma = Bc/\pi R$$

where B is the number of blades, R the extreme radius and c the mean chord over the effective part of the blades, and using the symmetrical section employed on the Cierva Autogyro C.6, with angle of pitch of 2 degs. and angle of incidence of 3·5 degs. (corresponding to a lift coefficient of 0·20 of the aerofoil section), the resultant blade element velocity V′ (of Major A. R. Low's suggested method for explaining the reason for the windmill rotating at all) is composed of an axial velocity u and a rotational velocity Ωr, and it is found that $u = 0{\cdot}026\,\Omega r$. If it be assumed that this condition is satisfied along all the blades, it becomes a simple matter to calculate the thrust of the windmill, and since the thrust supports the weight of the aircraft, the rate of rotation of the windmill is found to be

$$\Omega R = 79{\cdot}6\sqrt{(w/\sigma)}$$

where w is the loading per square foot of disc area and σ is the solidity of the windmill. The simple theory, Mr. Glauert pointed out, gave good agreement with the velocity determined in a more accurate manner, but the theory suffers from the defect that it insists on the torque of each blade element being zero instead of using the true condition that the torque of the whole windmill is zero. He explained that the simple theory was useful in obtaining a first estimate of the rate of rotation, and for indicating the fact that the angle of pitch of the blades must not be greater than 7 degs. if the rotation was to be maintained, while for reasonable stability, the angle of pitch should not be greater than 6 degs. The more detailed theory takes account of the flapping of the blades.

In the course of his lecture, Mr. Glauert admitted that the induced velocity was the most fundamental point in the development of the theory of the gyroplane, and that when this was established in s satisfactory manner, the rest of the work was only rather complicated mathematics or rather tedious arithmetic. He then proceeded to consider this subject in more detail, evolving formulæ for thrust, longitudinal force and lateral force. With a full-scale windmill a maximum lift coefficient of 0·6 might be expected, and a lift-drag ratio of the order of 6·5. These were figures derived from the theory. The corresponding values for a model would, the lecturer stated, probably be 0·5 and 4·5 respectively.

A table giving conditions for top speed was interesting, and is given herewith:—

σ	0·10	0·15	0·20
$\Omega R/V$	2·28	2·12	2·00
$10^4 w/V^2$ ..	0·84	1·00	1·28

As before σ is the "solidity" of the windmill, ΩR the rotational velocity at extreme radius (in other words, tip speed), w the loading per square foot of disc area, and V the translational speed of the aircraft. For any given top speed there is a best wing loading. The limiting condition that the translational speed should be less than $1/2\ \Omega R$ is satisfied in all cases, but the best loading rises as the square of the top speed. Also it is impossible to use a lighter loading, since this would give too low a value of tip speed to forward speed. Taking the solidity as 0·20, a top speed of 200 m.p.h. calls for a loading of 11 lb./sq. ft. of disc area, or 55 lb./sq. ft. of blade area. The stalling speed, which rises in the same ratio as the top speed, would be 62 m.p.h. With solidity of 0·10, the same top speed would call for a loading of 7·2 lb./sq. ft. of disc area, or 72 lb./sq. ft. of blade area, and the corresponding stalling speed would be 53 m.p.h.

Towards the end of his paper, Mr. Glauert admitted that the maximum lift/drag ratio occurs at a very small angle of incidence, where the approximations made in the theory become rather inaccurate, and where the scale effect on the model tests is large. He said, however, that neither full-scale tests nor wind tunnel observations gave any indication of a lift-drag ratio superior to that suggested by the theory.

SOME NOTES ON THE DESIGN OF AIRSCREWS.

The papers read before the Institution of Aeronautical Engineers have, generally speaking, been notable for their practical character. Perhaps none has been more so than the paper read before the Institution on January 25 by Captain F. S. Barnwell, the designer of the "Bristol" aeroplanes, under above title. Space does not permit of even a reasonably lengthy summary of Captain Barnwell's valuable contribution, and we must confine ourselves to the merest outline, referring readers desiring details to obtain a forthcoming issue of the Institution's Journal in which the paper will be published.

Captain Barnwell outlined the simple blade-element theory of airscrews, and then proceeded to explain the system which he has evolved in order to simplify propeller design in aircraft drawing offices. Briefly, the method consists in choosing a "standard" plan form, a "standard" test section" (*i.e.*, section of blade at 0·35 diameter from axis), and then applying empirical correction factors.

After explaining his method for aerodynamic design of airscrews, Captain Barnwell rounded out the paper with a section dealing with strength calculations, which he appeared to have reduced to an equally simple form of treatment. If the Barnwell method gives reasonably good results (and we may take it that he would not have put it forward unless he had thoroughly tried it out in practice) it should result in a very material reduction in the work involved in the design of airscrews, at any rate fairly normal airscrews. When we come to metal airscrews of fairly thin section it is probably rather a different story.

SOME NOTES ON THE DESIGN OF COMMERCIAL AIRCRAFT FROM THE OPERATIONAL POINT OF VIEW

IN his paper under above title, read before the Royal Aeronautical Society on February 17, Major R. H. Mayo stated that he did not personally consider air transport as now operated dangerous in comparison with other means of transport. But flying in general had not reached the degree of safety which had been achieved in air transport, and it was the lack of confidence in flying in general which was hindering the development of commercial aviation. He pointed out the importance to commercial aviation of reducing the fundamental aerodynamic risk of flying in general. In order to explain what he meant by "fundamental aerodynamic risk" he quoted a brief summary of the aerodynamic weaknesses of present-day aeroplanes which he made last year: "The landing speed is far too high and the length of run after landing is too great. The gliding angle is too flat, making the approach to a given spot for landing too difficult. The length of run required before taking off is too great. The angle of ascent after taking off is not great enough. If the aeroplane is stalled it becomes unstable, and at the same time control is lost."

Major Mayo thought, however, that formidable as the problems involved were, there were prospects that some, or perhaps all of them, would have been successfully tackled within the next few years. In this country we had recently had some important demonstrations as to the possibility of solving some of these problems: The slotted wing, the Autogyro, and the Pterodactyl.

Before reading his paper, Maj. Mayo pointed out that he hoped his audience would note that he had taken a much more modest title than the original one, which read "The Design and Operation of Commercial Aircraft."

The first part of Maj. Mayo's paper dealt with commercial aviation other than regular air transport in America and Canada. Turning to the subject of air transport, the lecturer pointed out that since 1919 the main development of British design had been in the direction of reliability. By this he did not intend to imply that there had been no progress in other directions, and he thought there could be no more striking tribute to the excellence of the general and detailed design of modern British aircraft than the flight just completed by the Secretary of State for Air and Lady Maude Hoare. As regards the amount of paying-load carried per horse-power of the engines, it had not been possible to make any substantial advance, because, although modern machines were more efficient, a good deal of the advantage gained had had to be sacrificed in the interests of safety and reliability.

On the subject of safety Maj. Mayo thought there were only three serious risks in present-day air transport, viz., those arising from: (1) lack of complete reliability in the power plant (2) bad visibility; (3) inherent aerodynamic defects in the design of present-day aircraft. Designers and operators had mainly concentrated on the first two of these problems. His own view was that real commercial success would not be achieved until the aerodynamic problem had been satisfactorily solved.

The lecturer then pointed out the important difference between air transport for the conveyance of passengers, and that for the conveyance of mails and goods only. European air services were nearly all passenger and goods services, but in the United States the main air lines were run exclusively for the conveyance of mails. The effect on design of this difference in the form of traffic had been a very striking one. The conveyance of passengers had demanded a very much more rapid development in the direction of safety, and the fact that passengers had been carried had ensured the maximum possible publicity for the occasional air transport accidents. The lecturer pleaded for the Press to bring home to the public the vast difference existing between the standard of safety in air transport and that in other branches of aviation. He believed that so long as flying accidents were occurring generally, so long would the travelling public be shy of travelling by air, and that for that reason the ultimate future of air transport depended on the solution of the problem of making aircraft generally aerodynamically safer.

Having pointed out how passenger traffic had stimulated technical progress in British air transport, Maj. Mayo referred briefly to the situation in America, where air transport had been confined to air mail services. There were two essential differences between American and European air transport. In America night flying had been developed and established as an essential part of air-transport operations, and American air transport did not cater for passenger traffic, the American view being that commercial transport could not pay unless night services were included, it being considered that the time had not yet arrived when flying was sufficiently safe to justify the transport of passengers. The lecturer, although admiring the determination with which night flying had been developed in America, did not think that technical progress in America had been so rapid as in Europe, and he called attention to the fact that in the American trans-continental mail services only single-engined machines were used, some of the designs dating back to the days of the war.

In dealing with the more important developments in British aircraft design which affected reliability, the lecturer said he did not propose to deal in detail with the old controversy as to the relative merits of single-engined and multi-engined machines. He thought it must be generally admitted that the problem had solved itself, at any rate for passenger transport. No matter how reliable power plants might be made in the future, it would be impossible to persuade the travelling public that the single-engined machine could give them the maximum possible degree of reliability. In the earlier days of British air transport the single-engined and twin-engined machines were about equally represented, and fought out the battle for supremacy until the twin-engined machine established itself as the safer proposition. There were twin-engined machines capable of flying on one engine, but they did not carry sufficient load to meet commercial requirements, and the greater safety of the twin-

THE CZECHO-SLOVAK AERO SHOW: An aerial view of the Palace of Industry, Prague, where the IVth International Aero Show will be held from June 4 to June 16 next.

engined machine lay in the fact that it could glide for a greater distance in the case of one engine failure than could the single engined machine.

The lecturer then gave some figures to show how a twin-engined machine might be expected to perform in the event of one engine failing. Taking a machine weighing 13,500 lbs. and fitted with two water-cooled geared-down engines developing a total of 850 h.p. at maximum revolutions, it might be assumed that the thrust horse-power at maximum speed would be about 660 h.p., or 77·5 per cent. of the maximum, but as the air speed was reduced the thrust horse-power fell off very seriously, partly owing to the reduction in revolutions per minute, and partly to loss of propeller efficiency. Taking the case where the machine was climbing at full throttle, the minimum thrust horse-power required to keep the machine in the air would be about 270 h.p. or 32 per cent. of the maximum, but at the low air speed at which this occurred the loss of thrust horse-power available would be so great that it was more efficient to climb at a higher speed. For the machine in question it might be taken as about 1·4 times the minimum speed. At this climbing speed the thrust horse-power required to maintain height would be about 315 h.p. In other words, more than 5 per cent. of the maximum brake horse-power of the engines would be wasted by climbing at this higher speed. It would be found that the brake horse-power of the engine had fallen by about 8 per cent., owing to a reduction in revolutions per minute, and that the efficiency of the propellers had fallen to about 68 per cent., so that the net thrust horse-power available was only 530 h.p., or 62·5 per cent. of the maximum power of the engines. This left a balance of about 215 h.p. available for climb, which would result in a rate of climb of 525 ft. per minute. In the event of one engine failing the machine would be flown under closely similar conditions. The machine would be kept at approximately the best climbing speed, when the thrust horse-power available would be about 265. The thrust horse-power required to maintain height would be increased by the extra drag of the stopped engine and by the drag due to setting the rudder over. The power absorbed in that way would be about 25 h.p., so that the thrust horse-power required to maintain height would be 340 b.h.p. Thus, there was a deficiency of some 75 h.p., which would result in the machine losing height at the rate of about 185 ft. per minute. Assuming that the height at which the engine failure occurred was 3,000 ft., the pilot would have 16 minutes in which to reach a landing-ground. The gliding range would be about 18 miles in calm air and 22 miles with a following wind of 20 m.p.h. In the case of a similar single-engined machine the rate of descent in case of engine failure would not be less than 800 ft. per minute, which would give the pilot 3¾ minutes from 3,000 ft. and a range of four miles in calm air or 4½ miles in a following wind of 20 m.p.h.

The twin-engined machine considered was assumed to be fitted with ordinary propellers of constant pitch. By the use of variable-pitch propellers a great improvement could be effected. In the example taken the loss due to reduction in revolutions per minute amounted to 8 per cent., and the loss due to flying at a higher speed than that at which minimum power was required amounted to 5 per cent. With the variable-pitch propeller the position would be that the thrust horse-power required to maintain height at climbing speed would be reduced to 270 h.p., while the thrust horse-power available would be increased to 595, assuming a propeller efficiency of 70 per cent. With both engines running the rate of climb would be nearly 800 ft. per minute as against 525 ft. per minute. With one engine out of action the thrust horse-power required and the thrust horse-power available would just about balance, so that the machine would be just able to maintain its height. At this point the lecturer referred to the article by Mr. C. C. Walker, published in *The Aircraft Engineer* of January 27, 1927.

Maj. Mayo thought that we should not have to wait long before an efficient and suitable variable-pitch propeller was available. As soon as such a propeller was available the position of the twin-engined machine would be considerably altered, and he thought it quite possible that the type would then have a new lease of life. Although the introduction of variable-pitch propellers would mean that radial air-cooled engines could be used to very much greater advantage, they would not, he thought, be really suitable for use in twin-engined machines until they had been fitted with reduction gears. He thought the only serious objection to the use of reduction gears was the extra noise entailed.

Having shown that the twin-engined machine had greater possibilities than was often supposed, the lecturer pointed out that there could be no doubt that the three-engined machine was essentially much more reliable than the twin-engined. It was not to be expected that all three-engined machines would have a rate of climb with one engine out of action. Machines of the type designed to meet the performance requirements for the European services should, when fitted with geared-down engines, have a small reserve of power with one engine out of action, but if fitted with ungeared engines it would have to be of good aerodynamic design to be able to hold its height. A modern three-engined machine with ungeared air-cooled engines could be expected to maintain height on two engines, but ability to climb on two engines was only to be expected from machines of considerably better performance than that required for the European services, the de Havilland "Hercules" being an example of such machines. In order to achieve the high performance it had been necessary to sacrifice a certain amount of pay-load, but without such sacrifice the service on the Cairo-Karachi route could not have been operated with the degree of safety and reliability that was now assured. Although modern three-engined machines represented a great advance in regard to safety and reliability, their virtues would be enormously enhanced if their respective engines were fitted with reduction gears and variable-pitch propellers. A combination of these two improvements would revolutionise the performance of such machines.

Maj. Mayo did not consider the three-engined machine the end of the development, but regarded it only as a stage in the development of the multi-engined machine. The four-engined machine had advantages over the three-engined machine, but the five- or six-engined machine had greater advantages over either, and a five- or six-engined machine, employing air-cooled engines with reduction gears and variable-pitch propellers, appeared to him to be the logical development which must come.

Maj. Mayo expressed the opinion that the advent of the really reliable aeroplane would greatly reduce the scope and utility of the seaplane and flying-boat, and said that if it became possible to fly from point to point with almost absolute reliability there would be little reason for employing marine types, except in certain special cases.

Turning to the subject of progress in regard to reliability of power plant, Maj. Mayo said the outstanding development during the last few years had been the world-wide movement in favour of the air-cooled engine for commercial work. This type of engine had certain definite advantages in regard to reliability, such as elimination of defects in the water-cooling system, which had been one of the most prolific causes of trouble, and greater accessibility, which facilitated inspection and maintenance. Apart from this definite development, progress in reliability of power plants had been mainly in the direction of the gradual elimination of the detail weaknesses in the engines themselves and in their installations. There were still points in the design of engines and their accessories which were far from satisfactory, including such important items as magnetos, sparking plugs, engine instruments, etc., and engine manufacturers would do well to remember that an engine was not reliable unless its accessories were reliable also.

As for controllability, the lecturer said that this most important question had been receiving much more attention during the last year or two than ever it did before. The general standard of controllability was distinctly above that of the earlier machines. Greater attention had been paid in particular to control at low speeds, and this had been of special importance in the case of the large three-engined machines now in service. By careful balancing of control surfaces it had been possible to provide sufficient control for large machines, but the lecturer thought that any further increase in size of commercial aircraft would necessitate the use of relay controls operated by servo-motor. So far as this country was concerned there had been no practical application to transport aircraft of the results of the work on the Handley Page slot and aileron control. Slot and aileron control could only be satisfactorily incorporated in a new design; its application to existing machines would involve considerable practical difficulties. The placing of a contract for a new type of commercial aircraft was a somewhat rare event, but he could assure the audience that a watchful eye was being kept on this and other developments. Among the "other" developments he included the good control achieved by Mr. Fokker in his thick-wing monoplane types.

On the subject of structural strength and detail design, Maj. Mayo praised the standard of general structural strength of British commercial aircraft, but thought it was true to say that the strength of detail parts and fittings in commercial aircraft was not up to the standard of strength of the main structural members.

The rest of Maj. Mayo's paper dealt briefly with the following subjects: instruments and equipment, fire prevention, general air service, air survey and exploration, transport of plant and machinery, taxi-flying, and club and private flying, and the paper concluded with a general review of the situation. Maj. Mayo concluded his lecture by saying that he had hoped to be able to make a statement on the "Open International Safe Aircraft Competition," sponsored by the trustees of the Daniel Guggenheim Fund for the promotion of aeronautics, of which Maj. Mayo is the English representative. The date of the paper, however, came just too soon for that to be possible, but he could inform the audience that the object of the competition would be to achieve a real improvement from the safety point of view in the aerodynamic characteristics of heavier-than-air craft, without any serious sacrifice of the good practical qualities of the normal present-day type. The competition would be open to competitors of any nationality, and very substantial prizes would be offered.

THE DISCUSSION.

The Chairman (Colonel the Master of Sempill) then called upon Mr. Handley Page to open the discussion.

Mr. Handley Page agreed with the lecturer that military flying accidents were more liable to occur than accidents to commercial aircraft, and thought the public did not differentiate between the two types of accidents. He was interested in Maj. Mayo's remarks concerning night flying, and quite agreed with the importance of this. He hoped that Imperial Airways had a programme in mind. He also agreed with the lecturer as to the value of gearing and variable-pitch airscrews, and what he personally would like would be a form of propeller in which it was possible to vary the diameter, pitch, and number of blades. (Laughter.) He thought the radial air-cooled engine showed a falling-off in power on climb quite apart from the causes for this which the lecturer had mentioned. He found himself unable to agree with the lecturer on the question of seaplanes. This type of aircraft offered great advantages in that it often enabled them to alight on and start from the heart of a city, where frequently there were wide rivers available. He also pointed out that very often aerial surveys were only possible by operating from rivers, and thought that the marine aircraft would always have a place in civil aviation. Mr. Handley Page could not share the lecturer's faith in machines with six or seven engines. Up to a point there was a gain in reliability by fitting more than one engine, but he thought such a multiplicity of engines would merely have the effect of making a breakdown certain. He was not aware of a fact to which the lecturer had referred, viz., that there was any difficulty about fitting slots and ailerons on existing machines, and could not quite imagine why this should be so. He concluded by saying that Maj. Mayo had admitted to disagreeing with the views he (Maj. Mayo) expressed four years ago, at the Air Conference, so that perhaps it was permissible to hope that in another four years' time something would be done with the slot and aileron type of control.

Mr. Bramson said he had one or two questions to ask. For instance, concerning the variable-pitch propellers, he would like to know whether it was proposed that these should be automatic in action. If they were to be operated by the pilot, he could see that unfortunate individual having a lively time adjusting some six or seven propellers in addition to carrying out his other duties. He thought that with the variable loads on machines what a pilot required was an instrument which would tell him exactly what incidence he was flying, in order that he might fly at the most economical angle. Concerning three-engined machines, he thought the man in the street had by now got the idea that the three-engined type was always safe. Some three-engined machines would not fly on two engines, and therefore it was almost a matter of obtaining money under false pretences to carry paying passengers in such machines.

Mr. C. C. Walker pointed out that in multi-engined machines such as the five or six-engined type to which the lecturer had referred, there was likely to be considerable interference with the aerodynamic qualities of the aeroplane, and he personally thought the twin-engined type more promising.

Maj. Bulman referred to Maj. Mayo's statement that the only objection to reduction gears was the noise. He could not quite agree with that view, since satisfactory reduction gears were difficult to design and, generally speaking, were a nuisance. They meant extra weight and complication, but he was afraid there was no help for that, and that the gearing must be produced.

Capt. Olley thought the advantage of having more than one engine was mainly that it enabled a pilot to get to a suitable landing-ground.

Capt. Hill agreed with Mr. Bramson that an instrument for indicating the actual angle of incidence was required.

Sqdn.-Ldr. Haig did not agree with the lecturer on the subject of the necessity for servo-motors in large machines. These added complications, and it was possible to provide control surfaces which would do the work of the servo-motor without their complication.

Mr. Savage thought it would be necessary to go back to the geared engine in order to get the efficiency, and he hoped that the pusher type would be developed, because in that the noise and smell of the engine was largely left behind.

Mr. Nicholson did not agree with the suggestion to go back to gearing. He thought what was required was to improve the propellers. In marine work development in propellers had enabled high speeds to be used which had previously been thought impossible. As regards the lecturer's statement about marine aircraft, he could certainly not agree. Three-quarters of the world's surface was water, and he would even go so far as to take the exactly opposite view of the lecturer and say that the commercial machine of the future would be a flying boat.

Mr. Lankester Parker also put in a good word for the seaplane, and pointed out that modern flying boats were more efficient than land machines.

THE AIR MINISTER'S RETURN

SIR SAMUEL HOARE, Secretary of State for Air, and Lady Maud Hoare arrived back in London on February 17, and thus brought to a successful conclusion the longest aerial voyage ever undertaken by a Minister—the total distance flown being 10,000 miles, not including the 2,500 miles in service machines during the tour of R.A.F. stations in India. It was, perhaps, a pity that English weather conditions prevented the final stage, from Paris to London, from being accomplished by air, otherwise the whole programme would have been carried out absolutely according to plan. However, they travelled to London by boat and train, being met at Victoria by a distinguished gathering, including Lord Lucan (representing the King), Sir Philip Sassoon, Marshal Sir Hugh Trenchard, Air Marshal Sir John Salmond, Air Vice-Marshal Sir John Higgins, Sir Walter Nicholson, etc., etc.

In a future issue of FLIGHT we hope to publish further information regarding this remarkable flight. It may be noted here, however, that His Majesty the King has bestowed an order of the Dame Commander of the British Empire on Lady Maud Hoare, in recognition of her part in this fine flight to India and back with the Air Minister.

Also, the Royal Aeronautical Society, the Royal Aero Club, and the Society of British Aircraft Constructors are giving a banquet to Sir Samuel Hoare and Lady Maud Hoare, to welcome them on their return from India, at the Savoy Hotel, London, on Wednesday, March 2, at 7.30 p.m. Lord Thomson, Chairman of the Royal Aero Club, will be in the chair. Tickets £1 1s. each (exclusive of wines). Members may bring guests, including ladies. Applications for tickets from members of all three above societies should be made at once to the Secretary of the Royal Aero Club, 3, Clifford Street, London, W. 1. (Telephone: Regent 1327).

Sir Samuel and Lady Maud Hoare have also accepted an invitation to be the guests of the Overseas League at a luncheon to be given at the Criterion Restaurant tomorrow, Friday.

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CLASSIFICATION OF LIGHT AEROPLANES

UNDER the new classification of light aeroplanes, adopted by the *Fédération Aeronautique Internationale* for record purposes, three classes will be recognised. Class I up to 200 kg. weight empty. Class II above 200 kg. but not more than 350 kg. empty weight, and Class III (two-seaters) up to 400 kg. empty weight. According to this classification, and so far as the figures which we have available indicate, there are but two British light 'planes which fall in Class I, namely, the two Hawker "Cygnets," which took part in (and one of which won) last year's *Daily Mail* prize. According to the figures for empty weight obtained on the "official scales" at Lympne, the Hawker "Cygnet" weighed 421 lb. (191 kg.) empty, while the Farnborough "Cygnet" weighed 431 lb. (195 kg.). Presumably, therefore, these two machines will be entitled to go for world's records in Class I after May 1.

The following light 'planes all fall in Class II: Avro "Avian" (Lympne type with "Genet" engine), Avro "Avis-Thrush," Blackburn "Bluebird-Genet," Bristol "Brownie-Cherub," Cranwell "C.L.A. 4-Cherub," de Havilland "Moth-Genet," Hawker "Cygnet-Cherub," Hawker Farnborough "Cygnet-Cherub," Parnall "Pixie III-Cherub," Short "Satellite-Cherub," Westland "Woodpigeon-Scorpion," and Westland "Widgeon-Genet."

The standard de Havilland "Moth" with "Cirrus" engine will probably fall in Class III, and it seems likely that the Avro "Avian" producton type with "Cirrus" engine will also be in Class III.

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THE ROYAL AIR FORCE MEMORIAL FUND

THE first meeting of the year of the Executive Committee of the Fund was held at Iddesleigh House on February 17.

The members present were :—Lord Hugh Cecil (Chairman) Dame Helen Gwynne-Vaughan, D.B.E.; Mrs. B. H. Barrington-Kennett; Sir Charles McLeod, Bart.; Air Marshal Sir John Salmond, K.C.B.; Air Vice-Marshal F. R. Scarlett, C.B.; Air Vice-Marshal C. A. H. Longcroft, C.B.; Air Commodore A. E. Borton, C.B.; Lieut.-Commander H. E. Perrin.

The chief business before the Committee was the consideration of the Annual Report of the Fund for the year January 1 to December 31, 1926, together with the Accounts of the Fund and, likewise, the accounts of the Vanbrugh Castle School, which are kept separate from the General Account of the Fund. After due discussion, the Report and Accounts, as audited, both as regards the General Account and the Vanbrugh Castle School Account, were approved, and the Honorary Treasurer, Sir Charles McLeod, Bart., and the Secretary were authorized to sign the accounts on behalf of the Executive Committee, and the Report, when ready (it is hoped at the end of March), will be published and copies sent throughout the Air Force, and to all Vice-Presidents, Members of the Committee, subscribers, and others.

The Committee had under discussion the issue of a suitable small framed poster for distribution amongst the messes and institutions throughout the Royal Air Force, setting forth the objects of the Fund and what it has done in the past six and a-half years, and outlining its future activities.

It was announced to the Committee that the Vanbrugh Castle School, Maze Hill, Blackheath, had reopened for the Spring Term on January 5 last, with a full complement of 38 boys.

Air Commodore F. C. Halahan, C.M.G., Commandant of the Royal Air Force Cadet College, Cranwell, Lincs, was elected a member of the Executive Committee.

The next meeting of the Executive Committee is fixed for April 27, at 3 p.m.

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Air Transport Conference at Vienna

AT the conference of the International Air Traffic Association which opened in Vienna on February 18, it was decided that the following three principal main lines should form the basis of European air traffic: the north-south line from Malmo, via Berlin, Vienna and Venice, to Rome; the west-east line from Paris, via Berlin, to Moscow; the more southerly line west-east from Geneva, via Munich, Vienna, Budapest, Belgrade and Bucharest, to Constantinople. All these lines will commence this spring. An air post on the methods of the land post was discussed, and the introduction of a universal postage by air mail to popularise the air post. The Dutch delegate proposed Berne as the centre of the European air-post traffic. It was agreed to issue an international air-traveller's ticket which held good for all air lines, and to allow children less than one year of age free transit, half fares up to the age of seven, and full fares thereafter. There were various opinions on the length of notice required for the cancellation of an issued ticket. Russia advocated 48 hours' notice, and others 24 hours', besides 10 per cent. forfeit of fare. Luggage up to 15 lbs. would be carried free. The British companies place no limit on luggage above that weight, which can be conveyed for extra payment, but certain Continental companies using smaller machines intend to do so in their territory. The air lines repudiated all responsibility for injuries, delays or other inconveniences during flight, and recommended a special insurance. A summer time-table was presented and adopted. Hungary and Switzerland were elected as new members to the Association, and Esthonia, Poland and Italy, though still not members, were represented.

Civil Aviation and Disarmament

AT the conference in Brussels of the Committee of aviation experts convened by the League of Nations, to which we referred in our last issue, the English delegates were in favour of military aviation causing no interference to civil aviation, but France, Poland, Rumania and Belgium seemed to consider the question purely from a military value point of view. The Committee passed resolutions that civil aviation should not be effected by the limitation to aerial armaments, and should be directed solely towards economic ends, and be independent of military interests. Further, that if States intervened in aviation they should do so with separate departments for both divisions. It was desirable, they declared, that States should not prescribe military features for civil aircraft, so that the latter should have a high factor of safety and economic advantage.

Personals

To be Married

The engagement is announced between ALFRED WILLIAM EDWARD GOURIET, late Middlesex Regt., and R.F.C., only son of the late Mr. and Mrs. A. V. Gouriet, of Chelsfield, Kent, and MARY DOUGLAS, only child of Dr. and Mrs. William PRENDERGAST, of The Close, Winchester.

The engagement is announced of FLIGHT-LIEUT. ROBERT F. C. METCALFE, R.A.F., eldest son of the late Frederick W. Metcalfe, of the London Stock Exchange, and Mill Hill House, Brentwood, and Mrs. E. L. Metcalfe, of Brentwood, and MISS INEZ HOPE WHITE, elder daughter of W. A. ESMONDE WHITE, and Mrs. G. L. WHITE, and grandchild of the late William A. White, Parliamentary Solicitor, and Mrs. Agnes S. White, formerly of Dudley Grove House, Paddington, W., and Abingdon Street, Westminster.

A marriage will take place quietly at St. Mark's, Peaslake, on March 8, between Mr. BERNARD DE NEVERS, late R.A.F., only son of the late Albert de Nevers and Mrs. de Nevers, and Miss CECILY VOLKERT, third daughter of Mr. Charles Volkert and the late Mrs. Volkert, and grand-daughter of Dr. Chrysander.

The engagement is announced of Mr. NORMAN ANTHONY PLINT PRITCHETT, R.A.F., only son of the Rev. N. and Mrs. Pritchett, of The Vicarage, Grain, and SYLVIA, only daughter of Mr. E. Cecil HARRIS, H.M. Coroner for Kent, and Mrs. Harris, of Trewinnard, Sittingbourne.

Death

JAMES ROBERT ERSKINE-MURRAY, D.Sc., F.R.S.E. (late Major, R.A.F.), who died on February 12, at The Retreat, Portsmouth, after a very short illness, was the eldest son of Alexander Erskine-Murray.

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IN PARLIAMENT

Stag Lane Aerodrome Accident

CAPTAIN GARRO-JONES asked the Secretary of State for Air on February 16, whether he had read the findings of the court of inquiry into the accident at Stag Lane Aerodrome, in which Mr. J. M. Michie was killed ; and whether he will publish the findings ?

Sir P. Sassoon : I assume the hon. and gallant Member has in mind the results of the investigation held by the Inspector of Accidents into accidents to civil aircraft. It is not the practice to publish the Inspector's Report, but I can state that the conclusion at which he has arrived is that the accident was due to errors of judgment on the part of the pilot.

Dr. J. Bjerknes' Work, Meteorology

CAPTAIN GARRO-JONES asked the Secretary of State for Air whether he can publish in any form the nature of the successful meteorological theories propounded by Dr. J. Bjerknes after his work at the Air Ministry ?

Sir P. Sassoon : The general principles on which the Norwegian School of Meteorologists work are set out in considerable detail in the technical journals, especially in the publications (mostly in English) of the Geophysical Institute of Bergen. As regards the work which Dr. Bjerknes carried out at the Air Ministry and which related to the application of the above principles to specific cases, a report has been prepared by him and circulated in manuscript to professional staff of the Meteorological Office ; its publication as a Geophysical Memoir of the Office is under consideration.

Aeronautical Research

CAPTAIN GARRO-JONES asked what is the total sum which has been expended on aeronautical research since the beginning of 1919 ?

Sir Philip Sassoon : The total sum expended on scientific research and technical development, as detailed in Appendix II of the current Air Estimates, from the 1st April, 1919, to 31st March, 1927, including expenditure still to be incurred this financial year, is approximately £8,500,000.

Hendon Aerodrome

SIR FREDRIC WISE asked the Secretary of State for Air the price paid for Hendon Aerodrome and the land ; and what is the cost per acre ?

Sir P. Sassoon : The precise cost cannot yet be given, since it will depend upon the prices realised for the surplus property included in the purchase but not required by the Air Ministry ; it is estimated, however, that the final cost of the 300 acres, together with buildings valued at £100,000, will work out at approximately £300,000.

Airship Gas Containers

SIR F. HALL asked the Secretary of State for Air whether, seeing that the gas containers for the new airship R 100 are being made in Germany, he will say whether the material for this purpose can, at the present time, be manufactured in this country ; and, if not, what is proposed to be done to remedy this state of things ?

Sir P. Sassoon : The Air Ministry have been informed by a firm in this country that the material can now be manufactured through their agency in Great Britain, and this statement is now under investigation. Research is being carried out with a view to providing a synthetic substitute for skin-covered fabric.

Sir F. Hall : Do I understand then that the gas containers are not being made in Germany ? Do I understand, on the other hand, that they are being manufactured in this country ?

Sir P. Sassoon : The firm to which I referred are at present undertaking experiments for manufacture.

Sir F. Hall : Do I understand we are left at the mercy of foreign countries for the manufacture of one of the most vital parts of the airships of this country ?

Sir P. Sassoon : My answer expressed the hope that it would not be so.

Sir F. Hall : There is no satisfaction in that.

Arms Embargo Agreement

CAPTAIN GARRO-JONES asked the Secretary of State for Foreign Affairs whether he is aware that Chinese agents in European countries are buying aeroplanes and aeroplane armament and hiring pilots ; and whether he will make diplomatic representations to prevent or restrict such transactions pending the stabilisation of the Chinese situation ?

Sir A. Chamberlain : I am fully aware that both parties in the Chinese civil war are acquiring military aircraft and aeroplane armament from various European countries and that they are making use of European aviators. Whenever possible, representations against breaches of the China Arms Embargo Agreement of May, 1919, are made on behalf of His Majesty's Government, but owing to the care with which these transactions are disguised, it is not always possible to produce the exact and categorical evidence that would be necessary for an effective protest. Further difficulties arise from the fact that some of the principal arms-supplying countries are not parties to the Embargo Agreement, and also from the fact that among the Powers party to that Agreement there are differences of opinion as to its interpretation.

Aircraft Construction at the Royal Dockyards

MR. HORE-BELISHA, on February 17, asked the Secretary of State for Air whether he had given further consideration to the construction of aircraft in His Majesty's dockyards ; and whether skilled personnel, of whom so many are now unemployed, will be engaged on such work ?

Major Cope (Lord of the Treasury) : I have been asked to reply. The question raised has frequently been examined by the Air Ministry, who, however, remain of the opinion that the proper policy is to rely upon the aircraft industry for construction.

Schneider Cup

LIEUT.-COMMANDER KENWORTHY asked why no British aeroplane or seaplane competed in the last race for the Schneider Cup ; and what steps if any, were taken by the Air Ministry to assist or encourage the entry of a British machine or machines ?

Major Cope : I have been asked to reply. Entries for the Schneider Cup are made by the Royal Aero Club, and at a meeting held at the Royal Aero Club on March 19, 1926, it was unanimously decided that it was inexpedient for the club to make a challenge for the Schneider Cup Race that year. In view of the above decision, the need for any steps on the part of the Air Ministry did not arise.

Lieut.-Commander Kenworthy : Was the Air Ministry consulted by the club or informed of this decision ?

Major Cope : I cannot add anything further to my answer.

R.A.F. Training Establishments

SIR F. HALL asked the Secretary of State for Air the reasons which make it necessary to employ 116 officers and 860 men to supervise the training of 2,000 boys at Halton, while at Beachley 18 officers and 200 men are found sufficient to look after 980 boys ; and is he aware that the cost of training a boy at the latter place is £115 a year, compared with £195 at Halton.

Major Cope : I have been asked to reply. The number of apprentices at present under instruction at Halton is 2,487. This number will be gradually increased to 3,000. The authorised establishment of officers and airmen for the instruction of the 3,000 apprentices and for the upkeep and administration of the station is 88 officers and 819 airmen, but the forthcoming estimates will show that the staff is less than these numbers. By the courtesy of the War Office, the Army establishment at Beachley was lately visited by representatives of the Air Ministry, and my right hon. friend is satisfied that the differences in numbers employed and in the cost of the two establishments are due to the greater complexity of the equipment in use at Halton and of the training required by the aircraft apprentices, for whom a large amount of individual instruction is essential to fit them for their future responsibilities for the safety of aircraft in flight.

Airship R.100 Gas Containers

LIEUT.-COMMANDER KENWORTHY asked the Secretary of State for Air whether the gas containers for the British airship R.100 are being manufactured in this country ; and, if not, where they are being manufactured ?

Major Cope : The gas containers referred to are being manufactured by the B.G. Textilwerke G.m.b.H. of Berlin.

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British Air Mail during 1926

THE Postmaster-General communicates the following particulars of outgoing British Air Mail traffic during 1926 :

Nearly 17,000 lbs. of letter mails were conveyed during the year, an increase of about 8 per cent. over 1925. The mails for Paris, Switzerland, Belgium, Holland, Scandinavia, and the East Baltic countries and Russia have all substantially increased. On the other hand, there has been a decrease in the mails for Morocco and for Germany. The latter is partly due to the removal of the British forces from Cologne. The use of the United States Air Mail Service is small, but steadily growing ; the Cairo-Baghdad Air Mail Service carried nearly 7,000 lbs. of mail, an increase of 15 per cent.

Full use has been made of all new services which could be used with advantage for the mails, whether British or foreign, and the following routes were made available for the first time in 1926 :—From London to Lyons and Marseilles, giving a supplementary posting for India, etc., up to Thursday midnight in London ; to Frankfort and Munich via Cologne ; from Paris and Zurich to Vienna, Budapest, Bucharest and Constantinople ; and from Toulouse to Dakar (an extension of the Morocco Air Mail). In most cases these routes were available only during the latter part of the summer. Official facilities for the use of the Colombian Air Mail service, which offers a saving of 10 or more days in onward transmission of letters from the Atlantic Coast of Colombia to Bogota and other places in the interior, were instituted in the last month of the year.

Reduced rates for parcels to Germany, Switzerland and Holland were introduced, and the acceptance was commenced of heavy parcels up to 22 lbs. in weight for Germany and Switzerland. The total traffic (55,000 lbs., or 25 tons) showed an increase of 11 per cent., due principally to an increase of 64 per cent. in the volume of mail for Germany (nearly 10 tons).

Parcel services were in operation during the year to France (Paris only), Germany (Cologne, Hamburg and Berlin), Switzerland and Holland. Owing to the relative slowness of the ordinary parcel post (which is not conveyed in foreign countries by the express trains used for the letter mails) the gain in time by the use of the air-parcel service is particularly marked.

SERVICES RUGBY TOURNAMENT

Royal Air Force *v.* Royal Navy

On February 19, at Twickenham, in the presence of H.R.H. Prince George, R.N., and a large crowd, the Navy beat the Air Force by 1 goal and 1 try (8 points) to 1 try (3 points).

The three matches of the Services Rugby Tournament always arouse special interest and enthusiasm, and in that respect are only surpassed by the internationals and the 'varsity match. Yet, to the student of the pure science and art of Rugby football, they are always somewhat disappointing games, because each side is rather a collection of 15 good players than a well-moulded and well-trained team. The men in each formation have not, as a rule, played together sufficiently often to have gained a complete mutual understanding. The spectator misses the joy of watching a really efficient and well-oiled machine at work. Passes are sent out wildly, and halves and three-quarters alike seem to have but the haziest idea of where a comrade will be found and what he is going to do next. But if team work is indifferent, individual effort is always of the most strenuous nature, and the games are always played in the most admirably sporting spirit.

The match between the Navy and the Air Force was one of the most exciting inter-Service games ever seen. The two teams were very equally matched, both in merits and in shortcomings, and until quite near the end it seemed quite possible for either side to win. So closely matched were they, that the slightest dipping of the scales to one side or the other would mean the difference between victory and defeat. When one analyses the game to account for the Navy's victory, the only point which stands out with unmistakeable clearness is the excellence of Sellar's play at full back for the Navy and the failure of the Air Force to realize that danger. Secondly, one would put a slight superiority of the Navy's forwards, particularly in the loose. It was not very marked; the sea-blue pack gained no overwhelming victory over the sky-blue pack. But in a game of this nature, this slight superiority applied at critical moments, and assisted by the excellent kicking of Sellar, was just enough to win a match which many spectators thought should really have ended in a draw.

Commander Davies says in his book on Rugby football that a team should always play up to its own strongest point, and should avoid playing to the strong points of its opponents. Now in this match, the Navy's strongest point was Sellar, who has twice made good as full back for England, and who seems to improve in every match which he plays. He has proved his merit, and he is rapidly gaining experience. Now when you are opposed to a full-back of class, then punts across or ahead become a gamble which is not justifiable; and kicks for touch which fail to find touch are a crime. Several times the Air Force outsides indulged in that gamble and committed that crime. Thus, hard-won ground was lost, and the situation was changed into Air Force defence.

THE TEAMS

The Royal Navy	Royal Air Force
Full Back: Sub-Lieut. K. A. Sellar* (R.N. College, Greenwich)	*Full Back:* Fl. O. T. A. Hale-Munro (No. 41 Sq., Northolt)
Three-quarters	*Three-quarters*
Right Wing: Sub-Lieut. N. Kennedy (H.M.S. "Dryad")	*Right Wing:* Flight-Lieut. O. C. Bryson (Cadet College, Cranwell)
Right Centre: Sub-Lieut. T. S. Lee (H.M.S. "Dolphin")	*Right Centre:* Pilot Officer F. S. Hodder (No. 13 Sq., Andover)
Left Centre: Sub-Lieut. G. M. Sladen (H.M.S. "Dolphin")	*Left Centre:* Aircraftsman D. Massey (M.T. Depot, Shrewsbury)
Left Wing: Lieut. W. H. Wood (H.M.S. "Champion")	*Left Wing:* Flight-Officer G. D. Harvey (No. 7 Sq., Bircham Newton)
Half Backs	*Half Backs*
Stand-off: Lieut. G. R. Cook (R.N.E. College, Keyham)	*Stand-off:* Pilot Officer J. Norwood (No. 23 Sq., Kenley)
Scrum: Joiner T. Husson (H.M.S. "Maidstone")	*Scrum:* Sq.-Leader J. C. R. Russell (Air Ministry)
Forwards	*Forwards*
Able-Seaman W. Paddon (H.M.S. "Woolwich")	Flight-Lieut. G. H. H. Maxwell* (Medical Services, Flowerdown)
M.A.A. W. G. E. Luddington* (H.M.S. "Impregnable")	Flight-Lieut. J. S. Chick, M.C., A.F.C. (Felixstowe)
Lieut. T. G. P. Crick (H.M.S. "Victory")	Flying Officer C. J. S. O'Malley (Medical Service, Halton)
Lieut. R. C. Harry (H.M.S. "Impregnable")	Corpl. M. G. Christie (M.T. Depot, Shrewsbury)
E.R.A. E. H. Harding (H.M.S. "Vivid")	Flying Officer F. V. Beamish (No. 5 Flying Training School, Chester)
Sub-Lieut. J. W. Linton (H.M.S. "Excellent")	Flight-Lieut. E. F. Turner, A.F.C. (No. 502 Squadron, Ulster)
Lieut.-Com. W. C. T. Eyres* (Capt.) (R.N. College, Greenwich)	Flying Officer P. G. Chichester (No. 9 Squadron, Manston)
Surg.-Lieut. L. B. Osborne (H.M.S. "Vivid")	Flying Officer J. G. Franks (R.A.F. Base, Leuchars)

* International.

["Flight" *Photograph*

R.A.F. *v.* Navy: A Navy Rush stopped within a yard or two of the line

There was one respect in which the play of both sides gave great satisfaction, and that was the tackling. It was hard, low, and sure; and the forwards, particularly the Navy forwards, took their full share of it. This in itself made good three-quarter play difficult. Over and over again the centre three-quarters found it impossible to make headway, and so the ball merely travelled across the field with a backwards inclination, until it came to the opposite touchline. Massey for the Air Force, and Lee for the Navy, on several occasions made gallant efforts to run straight, but usually they were not backed up and, when parting with the ball became a necessity, found no friend at hand to relieve them of the precious burden. There were bright exceptions, however, of which by far the most brilliant was the one Air Force try seven minutes after the start. Then, for once, the Air Force combination worked like the valves of a Rolls-Royce engine, and led us to expect that we were going to witness a glorious Air Force victory.

The game was so fast, and incident succeeded incident with such lightning rapidity, that a chronological history of it is not an easy task. After the two teams had been presented to Prince George, the Navy kicked off towards the north goal at 3 p.m. Sladen attempted a break-through for the Navy, but a rush by the Air Force forwards, in which O'Malley put in a useful dribble, took the ball back to the Navy's 25. A scrum was formed on the west side of the ground, and Russell, getting the ball from the heel, whipped out a pass to Bryson on the Air Force right wing. Bryson went hard down the touchline, and when he had drawn the defence he passed inwards to Hodder. The latter in his turn drew the defence and then returned with beautiful judgment and accuracy to Bryson. The wing man now found his path open and dropped over the line for the first try. It was as beautiful a piece of combined work as has ever been seen. Maxwell failed with the kick.

A good deal of up-and-down play followed, in which the Navy kept the ball mostly in Air Force territory, and Wood, who was playing with plaster and a scrum-cap on his head, had several runs and showed that he needed sound tackling. He always got it. Husson, the Navy scrum half, got kicked on the head, which did not make his passing any less wild than it was before. Russell then opened-up a movement to the left which looked promising, but Massey's pass to Harvey was not a good one, and the latter dropped it. The Air Force forwards then set up an attack, but a free kick to the Navy changed the complexion of affairs, while two minutes later a Navy attack was likewise nullified by a free kick to the Air Force. Then came a series of scrums on the Air Force line, and when a punt ought to have brought relief it dropped straight into Sellar's hands, with the result that the Air Force line was harder beset than before. At last Russell got the ball out to Bryson, who tried a punt across, with the natural and inevitable result that the Navy resumed their attack. But the Air Force defence was adequate, and the half-time whistle brought them welcome relief.

Air Force .. 3 points   Navy .. Nil.

On changing over, the Navy went off with a rush. One movement was stopped when Kennedy was forced into touch, but there was a series of scrums on the Air Force line, which ended in the Air Force touching down. The relief thus gained was nullified by another punt into Sellar's hands. There was some scrambling play in the Air Force 25 and finally Lee after a fine jinking run scored far out on the left. Luddington failed with the kick, and so the scores were now equal at 3 points all.

Play continued for a time in the Air Force half of the ground, but it was pretty equal, and not much was to be made of the territorial argument. Then the Air Force forwards put in one of the best bits of combined footwork which was seen that day. But the play ranged to and fro. Hale-Munro cleared several times in good style, and Massey had a determined run in which he got up and went on after being fairly grassed by a low tackle. But with 20 minutes still to go, Hale-Munro was rather badly injured in the back when stopping a Navy rush. He was carried off and laid on the straw at the side, while Chick took his place at full back. After five minutes, Hale-Munro returned, and promptly put in a useful kick, though limping very badly.

About this time the Navy might have been very dangerous had not the passing among their outsides been so execrable. Lee showed great ability in gathering the most impossible passes, but the Air Force tackling was too sound to permit such feats to become really dangerous. Harvey, about this time, received a number of passes from Russell, and strove hard to make good use of them. But Luddington always seemed to reach him about the same time as the ball; and when that Master Armourer has plastered himself firmly round the centre of an opponent's anatomy, the said opponent always finds progress extremely difficult. Massey was guilty of another kick into Sellar's hands with the usual consequences, but a minute later distinguished himself by a good run down the centre all on his lonesome. But the Navy forwards were now asserting superiority, and were rushing with some effect.

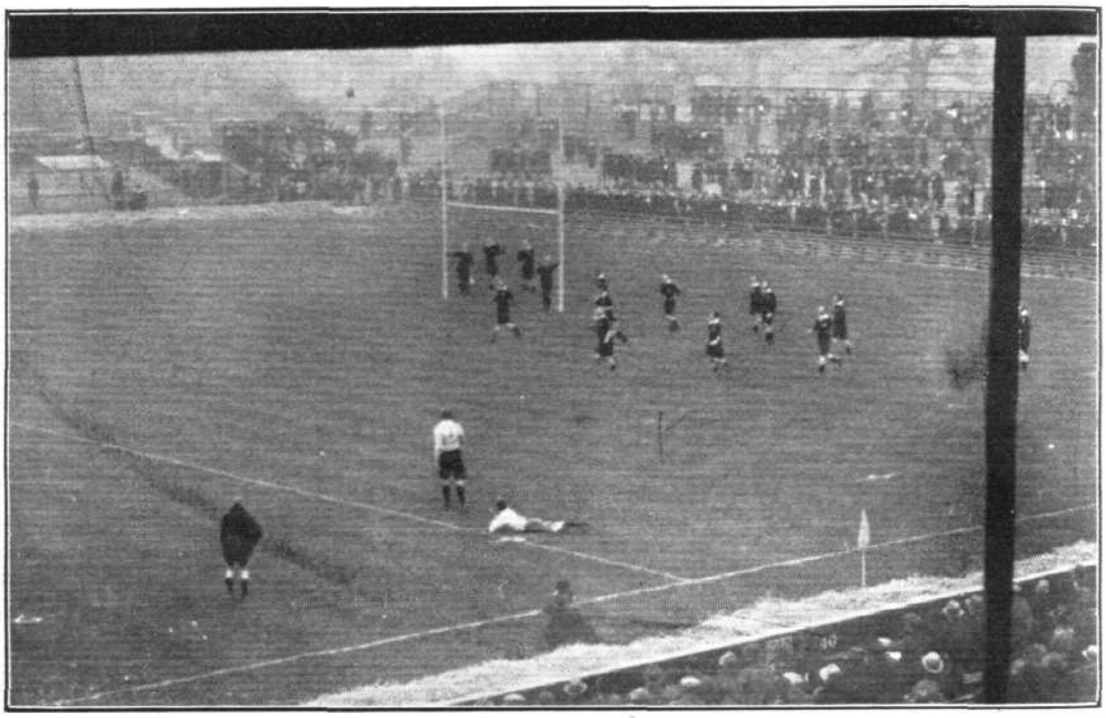
O'Malley tried to clear with a kick, but drove the ball into his opponents instead of over them. The Navy dribbled over the line, and then, of course, Hale-Munro's lameness was most unfortunate. Crick won the race for the ball and got the touch down, with Harry up to make assurance doubly sure. The try was gained well in the centre, and Sellar placed the goal with accuracy.

Navy	8 points.
Air Force	3 points.

Four more minutes of play remained, in which the Air Force made heroic efforts to equalize. They were helped by two free kicks, but faulty passing among their outsides spoilt whatever chances they might have had.

So ended a rattling good game, in which players and spectators were kept on the tenterhooks of excitement from the kick-off to the final whistle.

F. A. DE V. R.



["FLIGHT" Photograph

R.A.F. v. Navy: The R.A.F. fail to convert their one try.

THE ROYAL AIR FORCE

London Gazette, February 15, 1927.

General Duties Branch

The follg. Pilot Officers are promoted to rank of Flying Officer:— R. Matheson (Dec. 31, 1926); A. E. Hill (Jan. 18).

Air Commodore E. L. Gerrard, C.M.G., D.S.O., is placed on half-pay, Scale A. (Feb. 8); Flying Officer F. W. L. C. Beaumont is restored to full pay from half-pay (Feb. 7); Flying Officer W. G. Stafford, M.C., D.C.M., is placed on retired list (Feb. 5); Flying Officer R. H. S. Mealing is transferred to Reserve, Class A. (Feb. 16). The follg. relinquish their temporary commissions on return to Army duty:—Flying Officer (hon. Flight Lt.) K. M. Murray (Capt., P.W. Vols.) (Nov. 12, 1926); Flying Officer M. H. FitzGerald (Lt., E. Yorks Regt.) (Jan. 1). The short service commission of Pilot Officer on probation G. P. T. Gibbons is terminated on cessation of duty (Feb. 16).

Stores Branch

Wing Commander F. A. J. B. Wiseman, O.B.E., is transferred to Reserve Class C. (Feb. 17).

Flying Officer W. R. Donkin is granted a permanent commission in this rank (Feb. 16).

Chaplains' Branch

The Rev. M. J. Eland resigns his short service commission and is appointed an honorary chaplain to the R.A.F. (Feb. 15).

Reserve of Air Force Officers

The follg. are granted commissions in General Duties Branch, Special Reserve, as Pilot Officers on probation (Feb. 15):—F. Davison, J. Sillery, W. Hislop. The follg. Flying Officers relinquish their commissions on completion of service:—W. Allen (Feb. 15); O. E. Sharpe (Feb. 16).

ROYAL AIR FORCE INTELLIGENCE

Appointments.—The following appointments in the Royal Air Force are notified:—

General Duties Branch

Flight-Lieutenants: A. H. Goldie, to No. 4 Flying Training Sch., Egypt; 3.2.27. O. R. Gayford, D.F.C., to No. 47 Sqdn., Egypt; 1.2.27. A. J. E. Broomfield, D.F.C., to R.A.F. Depot, Uxbridge, on transfer to Home Estab.; 20.1.27. G. S. Taylor, to H.Q., Egypt; 28.1.27.

Flying Officers: J. W. New and Y. W. Burnett, to No. 47 Sqdn., Egypt; 2.1.27. W. A. Cooke, to No. 14 Sqdn., Palestine; 4.2.27. J. H. Powle, to Aircraft Depot, India, instead of to No. 20 Sqdn., as previously notified; 11.12.26. C. A. Bell, to Aircraft Depot, India, instead of to No. 31 Sqdn., as previously notified; 7.12.26. R. D. Adams, to Aircraft Depot, India, instead of to No. 31 Sqdn., as previously notified; 11.12.26. G. B. Collett, to Aircraft Depot, India, instead of to No. 5 Sqdn., as previously notified; 11.12.26. E. G. H. Russel-Stracey, to No. 20 Sqdn., India, instead of to Aircraft Depot, as previously notified; 7.12.26.

Pilot Officer J. C. Lewis, to Aircraft Depot, India, instead of to No. 28 Sqdn., as previously notified; 11.12.26.

Stores Branch

Flight-Lieutenant J. Hobbs, to Aircraft Park, India, instead of to Aircraft Depot, as previously notified; 11.12.26.

Flying Officers: A. S. Berry and R. Lamb, to R.A.F. Depot, Uxbridge, on transfer to Home Estabt.; 10.1.27. E. F. Elliott, to R.A.F. Depot, Uxbridge, on transfer to Home Estabt.; 2.1.27. D. A. W. Sugden, to R.A.F. Depot, Uxbridge, on transfer to Home Estabt.; 2.1.27. F. W. Todd, to No. 56 Sqdn., Biggin Hill; 4.2.27.

Flying Officers: F. C. C. B. Hichens, to No. 31 Sqdn., India; 13.12.26. M. W. Keey, to No. 28 Sqdn., India; 13.12.26. B. W. Hemsley, to No. 1 Wing H.Q., India, instead of to No. 5 Sqdn., as previously notified; 11.12.26.

Pilot Officers: P. J. Mote, to No. 20 Sqdn., India, instead of to Aircraft Depot, as previously notified; 7.12.26. J. E. Welman, to Aircraft Depot, India, instead of to No. 20 Sqdn., as previously notified; 7.12.26.

Accountant Branch

Flying Officer R. C. Clayton, to H.Q., Egypt; 22.1.27.

Medical Branch

Wing Commanders: J. McIntyre, M.C., M.B., M.A., to R.A.F. Depot, Uxbridge, on transfer to Home Estabt.; 10.1.27. J. McIntyre, M.C., M.B. M.A., to H.Q., Halton, Supernumerary, pending posting as Principal Med. Officer; 11.4.27.

Squadron-Leaders: R. A. G. Elliott, M.B., D.P.H., B.A., to R.A.F. Depot, Uxbridge, on transfer to Home Estabt.; 20.1.27. A. J. O. Wigmore M.B., to R.A.F. Depot, Uxbridge, on transfer to Home Estabt.; 2.1.27. E. N. H; Gray, D.P.H., to R.A.F. Depot, Uxbridge, on transfer to Home Est abt. 2.1.27.

Flight-Lieuts.: T. McClurkin M.B., D.P.H., to R.A.F. Depot, Uxbridge, on transfer to Home Estabt.; 2.1.27. C. A. Lindup, to R.A.F. Depot, Uxbridge, on transfer to Home Estabt.; 10.1.27. W. J. G. Walker, to R.A.F. Depot, Uxbridge, on transfer to Home Estabt.; 20.1.27.

Flight-Lieuts. (Qr.Mr. Medical): E. Bennett, to R.A.F. Depot, Uxbridge, on transfer to Home Estabt.; 2.1.27. E. Bennett, to R.A.F. Hospital Halton; 23.3.27.

Flying Officer: H. Penman, M.B., to Elec. and Wireless Sch., Flowerdown; 22.2.27.

Flying Officer (Dental) W. D. Guyler, to H.Q., Halton, on appointment to a temp. commission; 5.2.27.

NAVAL APPOINTMENTS

The following appointments have been made by the Admiralty:—

Lieutenants (Flying Officers, R.A.F.): The Hon. J. M. Southwell, to *Tamar*, and for flying duties in 401 Flight; Jan. 24. C. J. N. Atkinson, to *Argus*, and for full flying duties in 404 Flight; Jan. 26. F. G. Wynne, F. H. G. Oliphant, and E. O. F. Price, to *Argus*, and for full flying duties in 441 Flight on arrival at Malta. R. F. B. Cecil, to *Argus*, and for deck-landing training in 441 Flight; on arrival at Malta.

Royal Air Force

Flight-Lieutenants: J. A. McDonald, to *Hermes*, for duty with F.A.A. shore W/T stations. P. J. Farmer, to *Tamar*, for duty with F.A.A. repair section, Hong-Kong, and B. B. Caswell, to *Tamar*, for flying duties in 401 Flight; Jan. 24. C. E. W. Foster, to *Argus*, for flying duties in 404 Flight, and E. J. L. Hope, to *Argus*, for flying duties in 422 Flight; Jan. 26.

Flying Officers: G. H. Loughnan, J. F. F. Pain, F. C. Rowland, and N. V. Moreton, to *Hermes*, for observer duties in 440 Flight, and A. A. Jones, to *Tamar*, for duty with F.A.A. repair section, Hong-Kong; Jan. 24. N. Young, to *Tamar*, for flying duties in 401 Flight; Feb. 27. R. H. Rose, to *Argus*, for flying duties in 441 Flight; on arrival at Malta. W. D. Baxter, to *Argus*, for flying duties in 404 Flight, and E. A. H. Fisher, to *Argus*, for flying duties in 404 Flight; Jan. 26.

Pilot Officers: F. M. V. May and E. W. Webb, to *Hermes*, for observer duties in 440 Flight; Jan. 24.

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RESERVE OF AIR FORCE OFFICERS.

FIFTY OPENINGS FOR PILOTS

THE Air Ministry announces:—Increases in the Pilots' section of the Reserve of Air Force Officers are necessary as a result of the gradual expansion of the Royal Air Force, and the scheme, which was experimentally instituted in 1925 to enable the Air force to feed its reserve by drawing-up the younger generation who have had no flying experience, is to be extended.

A large number of openings, therefore, present themselves now to young men to be trained as pilots *ab initio*. At least fifty candidates will be taken by the Air Ministry if the necessary number of the right type are forthcoming.

The training will be carried out at the De Havilland Aircraft Co.'s School at Edgware, at the Bristol Aeroplane Co.'s School at Bristol, and probably also at the Beardmore Aviation School at Renfrew, near Glasgow.

Applicants must be of good education and physique, but need not have had any previous flying experience. They must be over 18 and under 25 years of age, though consideration may be given in certain circumstances to suitable applicants who are slightly over the latter age. Those judged from their applications to be suitable will be interviewed by a Selection Committee, and those selected after passing an examination by the Medical Board will be gazetted to commissions in the Reserve as pilot officers on probation. The probationary period is 12 months, after which, subject to satisfactory progress in training, etc., officers are confirmed in rank. Promotion to flying officer normally takes place after 18 months' service.

Commissions are granted in the first place for five years, but at the end of this period extension may be allowed at Air Council discretion for further periods each of not more than five years.

Flying training is arranged, as far as service requirements admit, at the civil aviation centre which is most convenient to the officer, and consists of a three months' course (preferably continuous, but which may be taken intermittently if necessary) during the first six months of service, six hours' solo flying (to be carried out within a total maximum period of 10 days' training) during the second six months, and 12 hours' solo flying (to be carried out within a total maximum period of 20 days' training) in each subsequent period of 12 months' service.

When undergoing training, or if called-up for continuous service in an emergency, an officer receives, generally speaking, the same pay and allowances as an officer of the same rank on the active list. The present rates of pay are 15*s*. 2*d*. a day for pilot officers and 18*s*. 10*d*. a day for flying officers, and the rates of allowances amount to about 7*s*. 10*d*. a day for officers of these ranks. In addition, an annual retaining fee of £30 is payable, subject to compliance with the regulations.

Application forms and further details can be obtained by applying to the Secretary (S. 7 Reserves), Air Ministry, Adastral House, Kingsway, London, W.C. 2.

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AIR MINISTRY NOTICES TO AIRMEN

Precautions against Collision during Foggy Weather

IT is notified:—In order to avoid risk of collision during foggy weather, aircraft coming from the Continent, whose wireless telegraphy or radio telephony installation has failed to function satisfactorily, should land at Lympne Aerodrome, Kent, where facilities for its repair will be available.

(No. 11 of 1927

Farnborough Aerodrome: W/T Masts. Rotterdam (Waalhaven): Levelling Operations

1. FARNBOROUGH.—Pilots who may be flying within the vicinity of Farnborough are warned that three masts, 70 ft. high, have been erected in the N.E. corner and two masts, 35 ft. high, have been erected at the S. end of the Officers' quarters on the E. side of the aerodrome. One mast in each group will be marked by night with a red light.

(No. 12 of 1927.)

CORRESPONDENCE

[*The Editor does not hold himself responsible for opinions expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters intended for insertion in these columns.*]

AN AUSTRALIAN MILESTONE

[2153] You may be interested to hear that a memorial has been erected on the foreshore at Torquay, Victoria, Australia, by the Historical Society of Victoria, to commemorate the first crossing by air of Bass Strait.

This noteworthy flight was, as you will remember, carried out on December 17, 1919, by Mr. A. L. Long on a Boulton and Paul P.9 aeroplane, fitted with a 90 h.p. R.A.F. 1A engine. The machine having been fitted with extra fuel tankage, a start was made from Launceston, Tasmania, at about half-past six in the morning, and the journey was safely terminated 6¼ hours later at Carey's Aerodrome, Melbourne.

The journey was not without incident for, when half-way across the Strait, a release, which had been improvised to replenish the engine oil supply, broke, necessitating a landing in a small field immediately after crossing the Australian coast at Torquay. Without stopping the engine Mr. Long jumped out of the machine and opened the oil cock, resuming his flight immediately.

Mr. Long carried letters from the Governor of Tasmania to the Governor-General and the Governor of Victoria, also letters from the Lord Mayors of Launceston and Hobart to the Lord Mayor of Melbourne, and from the Chamber of Commerce, Tasmania, to the Chamber of Commerce, Melbourne.

Taking into consideration the relatively low power of the aeroplane, this flight must be considered a valuable pioneering achievement, to which due tribute was paid at the unveiling of the memorial, which took place on November 27, 1926.

A. BICKTHORN

Norwich, February 15, 1927

PLATES OR FILMS

[2154] I have read with interest the excellent article by Major F. A. de V. Robertson on "Air Survey in Chittagong," which appeared in your issue of February 10.

May I be permitted to draw attention to a misleading statement in this article? Major Robertson says, "A modified L.B. camera is employed. This camera uses plates, which are essential when stereoscopic photographs are needed, as in the present case."

Plates are not essential for stereoscopic photography. Equally good results can be obtained with films. My company showed an example of stereoscopic photography at the Air Survey Exhibit which we prepared, in conjunction with the Air Survey Co., Ltd., for the Dominion Delegates at the Imperial Conference. These stereo photographs were taken from our Ordnance Survey air revision contract, and for this work we employed the Eagle-type camera, which only uses films. The experiment has been successful. We are also using the same camera with films for our air survey in Northern Rhodesia, where stereoscopic comparison of aerial photographs is required for geological purposes.

Films are quite suitable—in fact more suitable than plates—for small and medium-scale work, and also large-scale revision work. Plates are essential when dealing with highly accurate large-scale work, especially where it is necessary to contour.

The reason for this is that the plate is not liable to distortion, due to shrinkage, and therefore forms a more stable base than that provided by the film. The distortion due to shrinkage in the film is so small that it can be ignored for small and medium-scale mapping and large-scale revision work. Films are more easy to handle than plates, and by their use we have been able to reduce air-survey costs.

I believe I am right in saying that the views that I have expressed are also held by the Air Survey Committee.

H. HEMMING, Managing Director,
The Aircraft Operating Co., Ltd.

London, February 18, 1927.

Anti-aircraft (T.A.) Headquarters and Chelsea

ALTHOUGH it is open to much opposition from local residents defending the beauty of their surroundings, there is a proposal of the Army Council's to accommodate two brigades of the anti-aircraft forces of the Territorial Army in the grounds of the Duke of York's Headquarters, Chelsea. Originally they were to be housed in Rochester Row, Westminster, where a site for the purpose was actually purchased; then the economies to be enforced in the Territorial Army for the next financial year cancelled this plan and an alternative scheme suggested was the reselling of the site, which has not yet been done, and the erection of cheap light structures in the Chelsea grounds.

Institution of Aeronautical Engineers

Two papers are to be read before the Institution of Aeronautical Engineers next month, as follows:—March 8: "Portable Hangars," by Maj. H. N. Wylie, B.Sc., F.R.A.S. March 22: "Aircraft Law," by Mr. Lawrence A. Wingfield. It should be noted that the latter takes the place of Mr. W. Villa Gilbert's paper on "A New Type of Wing Construction."

NEW COMPANIES REGISTERED

AIR PRESS AGENCY, LTD.—Capital £1,000, in £1 shares. Aviation and general news agency, etc. Solicitor: A. Bolden, 35, New Broad Street, E.C.2.

BRITISH ANZANI ENGINEERING CO., LTD.—Capital £3,000, in 2,000 10 per cent. cumulative preference shares of £1 each, and 20,000 ordinary shares of 1s. each. Motor car manufacturers, makers of aeroplanes, seaplanes, etc. Solicitors: Hancock and Willis, 1, Verulam Buildings, Gray's Inn, W.C.1.

CIRRUS AERO-ENGINES, LTD., Regent House, Kingsway, W.C.2.—Capital £10,000, in £1 shares. Acquiring goodwill of that part only of the business of A.D.C. Aircraft, Ltd., which is concerned with the manufacture of Cirrus aero-engines; and in conjunction therewith the registered trade-mark "Cirrus," No. 453,271 in Class 6. Solicitors: F. S. Gaylor, 4, Old Burlington Street, W.1.

PUBLICATIONS RECEIVED

Technical Notes: No. 248.—The Drag of Airships: Drag of Bare Hulls—II. By Lieut. C. H. Havill, October, 1926. *No.* 249.—Effect of Protruding Gasolene Tanks upon the Characteristics of an Airfoil. By Eastman N. Jacobs. October, 1926. *No.* 250.—Influence of the Orifice on Measured Pressures. By Paul E. Hemke. November, 1926. *No.* 252.—Resistance of a Fifteen-Centimetre Disk. By J. M. Shoemaker. December, 1926. U.S. National Advisory Committee for Aeronautics, Washington, D.C., U.S.A.

AERONAUTICAL PATENT SPECIFICATIONS

(*Abbreviations*: Cyl. = cylinder; i.c. = internal combustion; m. = motor. The numbers in brackets are those under which the Specifications will be printed and abridged, etc.)

APPLIED FOR IN 1925
Published February 24, 1927

26,592. H. DU BOURG DE BOZAS. Wireless-direction-finding-apparatus. (250,170.)
26,993. L. R. WOODS. Methods of affixing panels and eyelets in fabric surfaces. (264,923.)
27,330. BRISTOL AEROPLANE CO., LTD., and A. H. R. FEDDEN. Balancing of engines, etc. (264,939.)
27,474. T. D. KELLY. Aircraft. (264,942.)
29,174. J. DE LA CIERVA. Aircraft with rotative wings. (264,963.)
29,630. J. DE LA CIERVA. Aircraft with rotative wings. (264,965.)
29,776. J. DE LA CIERVA. Aircraft with rotative wings. (264,968.)
30,912. SOC. ANON. POUR L'EXPLOITATION DES BREVETS KUNZER. Apparatus for lighting landing-place from aircraft. (260,933.)
31,639. C. B. HARRIS. Apparatus for synchronizing discharge of aircraft machine guns with propeller rotation. (264,985.)

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758. H. O. SHORT. Air-propellers. (264,992.)
18,713. E. DELALE. Carriage bodies. (258,231.)

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